Environmental Baseline (EBS) Study - Carmichael Village Subdivision, Carmichael Road, Nassau New Providence, Bahamas

Prepared by the Forestry Unit,
Ministry of the
Environment & Housing

at the instance of
The Department of Housing

Submitted to
The Department of Environment Planning & Protection
Ministry of the Environment and Housing

Dated: 17th May 2021

Table of Contents

1.0 Executive Summary 3
2.0 Purpose and Scope 4
3.0 Geographical Setting 4
4.0 Existing Land Use 5
5.0 Department of Housing and Project Description 5
5.1 History 5
5.2 Vision 5
5.3 Mission 5
5.4 Project Overview 6
6.0 Physical and Biological Baseline 8
6.1 General Climate of the Bahamas 8
6.2 Geography 9
6.3 Topography 9
6.4 Hydrological and Hydrogeological Resources 9
6.5 Hurricanes 10
6.6 Air and Noise Quality 10
6.7 Botanical Survey 11
6.7.1 Methodology and Analysis 11
6.7.2 Botanical Species Identification 11
6.7.3 Vegetation Type 15
6.7.4 Human Altered 15
6.7.5 Vegetation Map 16
6.7.6 Invasive Species 16
6.7.7 Protected Species 17
6.7.8 Overall Species Diversity 19
6.7.9 Avian Assessment 23
6.7.9.1 Avian Survey Methodology 23
6.7.9.2 Avian Survey Results (Species Observed and Diversity) 23
6.7.9.3 Range 24
6.7.9.4 Conservation Status 24
6.7.9.5 Habitat Utilization 25
6.8 National Parks 26
6.9 Socio-Economic 26
6.9.1 Population 26

6.10. Cultural Resources 27
6.10.1. Bahamian Arts and Crafts 27
6.11. Transportation 27
6.12. Utility Provisions 28
6.12.1 Sewer Services 28
6.12.2 Potable Water 28
6.12.3. Electricity 28
6.12.4. Roads 28
7.0. Environmental Laws, National Environmental Policies, and International Conventions 28
7.1. Environmental Laws of the Bahamas 28
7.2. National Environmental Policies 30
7.3. International Conventions of Relevance 30
7.4. Government Departments and Local Non-Governmental Organizations 31
8.0 Register of Environmental Aspects 32
9.0 Environmental Management 34
9.1 Draft Environmental Management Plan Terms of Reference 34
10.0. Public Interactions/Communications 35
11.0. Recommendations and Mitigation Strategies 35
11.1 Methodology 35
11.2 Terrestrial Resource Management 35
11.3 Emergency Health and Safety 38
11.4 Solid Waste and Sewerage Management 38
11.5 Air Quality and Noise Attenuation 38
11.6 Forest Fires and Hurricane Risks 39
11.7 Invasive Species removal 39
11.8 Environmental Monitoring 39
12.0 Contributors 40
13.0 References 41
14.0 Appendices 42

1.0 Executive Summary

The Forestry Unit of the Ministry of the Environment and Housing was commissioned to undertake an Environmental Baseline Assessment (EBA) on some 60 acres of Crown Lands vested in the Department of Housing (Crown Grant A9-55). The land has been designated (zoned) residential by the Department of Physical Planning. The Department of Housing intends to develop the property into an affordable housing subdivision, under the Government's Guaranteed Loan Programme. A recorded survey plan NP 6049 of the subdivision proposes the development of some (358 lots) into four phases. Construction of homes and associated infrastructure are expected to start in Phase -1 (101 lots), comprising 75 homes and 31 service lots. This EBA documents the existing site conditions and outlines environmental management and mitigation strategies to offset the habitat/vegetation removals associated with the development.

Botanical surveys took place over the course of ten (10) weekdays between (February 8th through 19th 2021) and avian studies on 29th April 2021, to document existing biological conditions. Botanical results determined that the vegetation type on site comprised a severely human altered environment of secondary dry pine barren ecosystem, consisting of juvenile pine tree species (6%) in the overstory, and associated silver thatch palms (41%), brasiletto (5%), poisonwood (45%); cinnecord (6%) five finger (6%), and other understory species, with ground cover of bed grasses (66%), and ferns (6%). These species are typical of dry pine forest ecosystems on the pine islands of the Bahamas. The Caribbean Pine species (*Pinus caribaea var. bahamensis),* silver thatch palm (*Coccothrinax argentata*) and brasiletto (*Caesalpinia vesicaria)* species are protected under the ***Forestry (Declaration of Protected Tree) Order, 2021***, and hence the need for a mitigation strategy to offset their removal, and associated biodiversity habitats during construction of homes and subdivision infrastructure.

The site is home to many avian species, with nine (9) species identified, and include the endemic Bahama Woodstar, Eurasian Collared Dove, Mourning Dove, Common Ground Dove, Killdeer, Merlin, Gray Kingbird and the Northern Mockingbird. All species are protected under the Wild birds Protection Act, 1952 and no species identified is endangered (IUCN categories).

Significant impacts to the natural habitat will occur during housing development. It is anticipated that approximately 86% of the natural vegetation will be permanently loss/removed. Recommendations and mitigation measures are proposed as follows: Remove at least 5% of the silver thatch palms and translocate them along the main road verges and secondary roads into the subdivision, as part of the natural landscape; and to include other select native flowering plants to serve as biological corridors for avian species. Maintain the three (3) designated public park spaces as natural spaces (3.18 acres), and design as natural recreational parks. The parks to incorporate low impact nature trails, interpretative signs near species of interest along nature trails, and provide seating areas at designated shaded locations within the parks. The green spaces will serve as natural laboratories of learning/education with respect to the forest environment to the residents of the subdivision. Further, to prescribe in every lot sale agreement/conveyance that the purchaser must plant a minimum of five (5) native plants species (inclusive of two fruit trees) on their properties, upon completion of home construction and to encourage homeowners to plant native flowering plants to attract birds.

Continuous and consistent site inspections, along with strong communication between the Environmental Monitor and Contractors is critical at ensuring compliance with recommended environmental mitigation strategies. The EMP, with its monitoring checklist is the mechanism to document onsite practices, provide recommendations and make corrective actions where necessary.

2.0 Purpose and Scope

This Environmental Baseline Assessment (EBA), terms of reference (TOR) is prepared in consultation with the Department of Environmental Planning and Protection (DEPP). This Environmental Baseline Assessment for Carmichael Village Subdivision is written according to the terms of reference (TOR) to which the Department of Environmental Planning and Protection (DEEP) has the option to either issue of an approved Certificate of Environmental Clearance (CEC), or the rejection of the subdivision development.

The Purpose of this Assessment is to recognize and evaluate the environmental and socio-economic effects of the Carmichael Village Subdivision. It records the current site physical conditions, avian, wildlife, and botanical data before any activities are done in the area. These conditions are used to highlight current or potential impacts/issues, and to provide recommendations and mitigation strategies to minimize any adverse effects on the immediate area and its environs.

3.0 Geographical Setting

The Carmichael Village Subdivision is situated due west of the existing Dignity Gardens Subdivision, in the Western District of the Island of New Providence. The site is outlined in blue at ***Figures 1– 2*** below, and its relation to the proposed National Forest Estate boundaries and environs.

Figure – 1. *Map depicting the Carmichael Village Subdivision boundary (outlined in blue) in relation to the proposed National Forest Estate boundary (edged in yellow) and environs.* *(Source: Google Earth, 2021)*

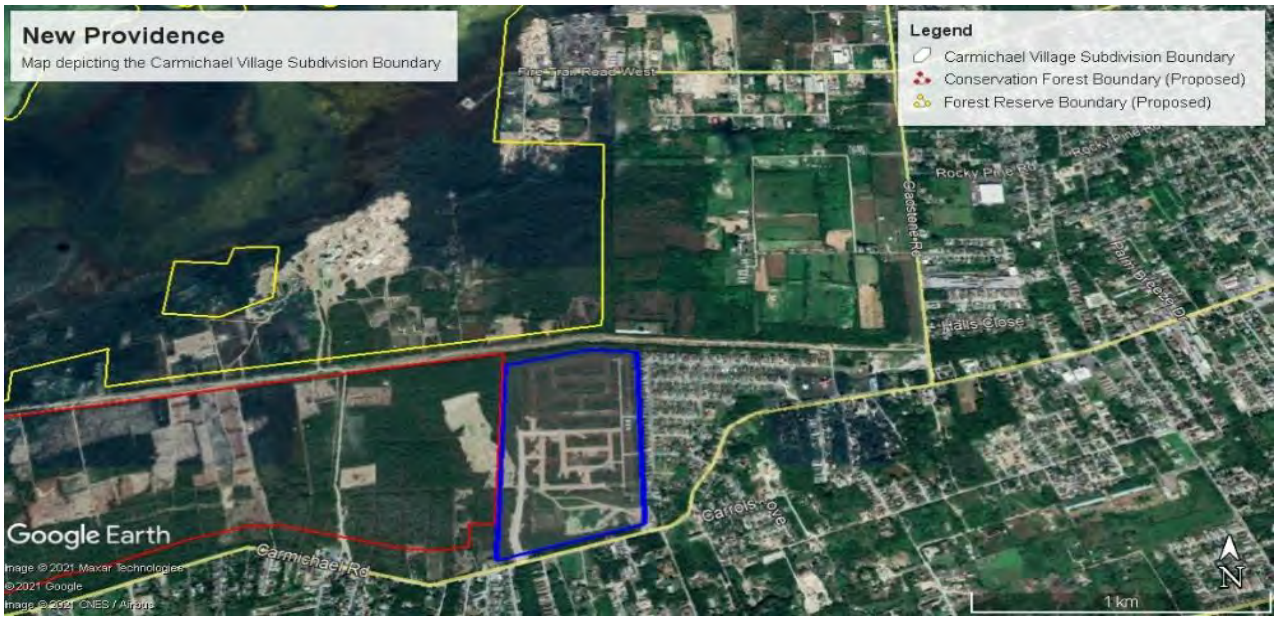


***Figure – 2**. depicts the boundaries of the Carmichael Village Subdivision (outlined in blue), in relation to Dignity Gardens Subdivision to the East, and proposed Forest Reserves to the west and northwest, and Carmichael Road to the south. (Source: Google Earth, 2021)*

4.0 Existing Land Use

Presently, the area proposed for the subdivision development existing land use is that of a natural pine forest ecosystem, and the site specific for the subdivision is rezoned residential by the Department of Physical Planning. Historically, the lands were used as wellfields for the extraction of fresh groundwater by the Water and Sewerage Corporation. Today, all wellfields in the vicinity of the site are abandoned.

5.0 Department of Housing and Project Description

5.1 History

The quest of the Bahamas Government to develop a housing program commenced in 1961 in the establishment of the Bahamas Housing Corporation. The Corporation was dissolved in 1964 and succeeded by the Ministry of Housing, with the adoption of the Bahamas Constitution. In 1965, the Department of Housing was created and falls within the portfolio of the Ministry of the Environment and Housing. The Department's functions and activities are governed by the Housing Act Chapter 199 and Housing Regulations.

5.2 Vision

The Vision of the Department of Housing is ***"to ensure that Bahamians throughout the country have access to adequate and affordable quality build housing in a clean and safe environment***."

5.3 Mission

The Mission of the Department is: ***"to facilitate the provision of affordable housing to Bahamians of low to medium incomes, by providing them the quality build houses or services lots, in collaboration with building contractors (approved builders) and financial institutions (approved lenders) by the way of government guaranteed mortgage loan program."***

5.4 Project Overview

The Department of Housing proposes to develop an affordable housing subdivision on some 60 acres of Crown lands vested in fee simple (Crown Grant) to the Minister with responsibility for Housing, from the Minister Responsible for the disposition of Crown Lands (**see Appendix H**). The subdivision will comprise 358 lots (average 52ft x 100ft – 5,200sq. ft.) and divided into four phases. The density level is expected to be HIGH at build out. Phase one of the area under consideration, will comprise some 107 lots (76 home constructions, of (4) four pre-design model homes; and 31 fully serviced lots to be sold to Bahamians, a 1.8 acre Nature Reserve Park, and a 30,000 sq. ft. Activity Park (basketball facility and seating area **(see Figure 4**). Phase two will comprise 76 lots, Phase three 80 lots, plus a 30,000 sq. ft. Activity Park, and Phase four comprising 93 lots. It is important to note that the Nature Reserve Park (1.8 acres) is significant, in that it reflects the intent of maintaining and enhancement of the natural biodiversity, with minimal impacts, for educational purposes. A further eight (8) lots are reserved as Commercial, and one community center lot.

Figure – 3. *Depicting a google imagery of the boundaries of the Subdivision, with cleared road network infrastructural works underway. Note the Dignity Gardens Subdivision to the East and Caribbean Pine forest to the West. (Source: Google Earth, 2021).*

Note that ***Figure – 3*** above, highlights that a road network system was pushed through the site previously some years ago, based on a previous subdivision design. Subsequently, a secondary pine forest ecosystem developed in the aftermath of the previous land clearance. The subdivision was redesigned with respect to lot and road layout, with a contract awarded for infrastructure works (roads, water and sewerage), as evident in the central west portion of property (new road network alignment). Where lots are below grade and subject to flooding, they will be backfilled to above road grade level, prior to home construction. ***Figure – 4*** below depicts the recorded survey plan (6094 NP) of the lot layouts (phase one edged in maroon), road alignments and connectivity to the main road artery of Carmichael Road to the south, and its relation to adjacent properties. The southern portion of the parcel comprising some 17 acres, is reserved for the construction of a public school.

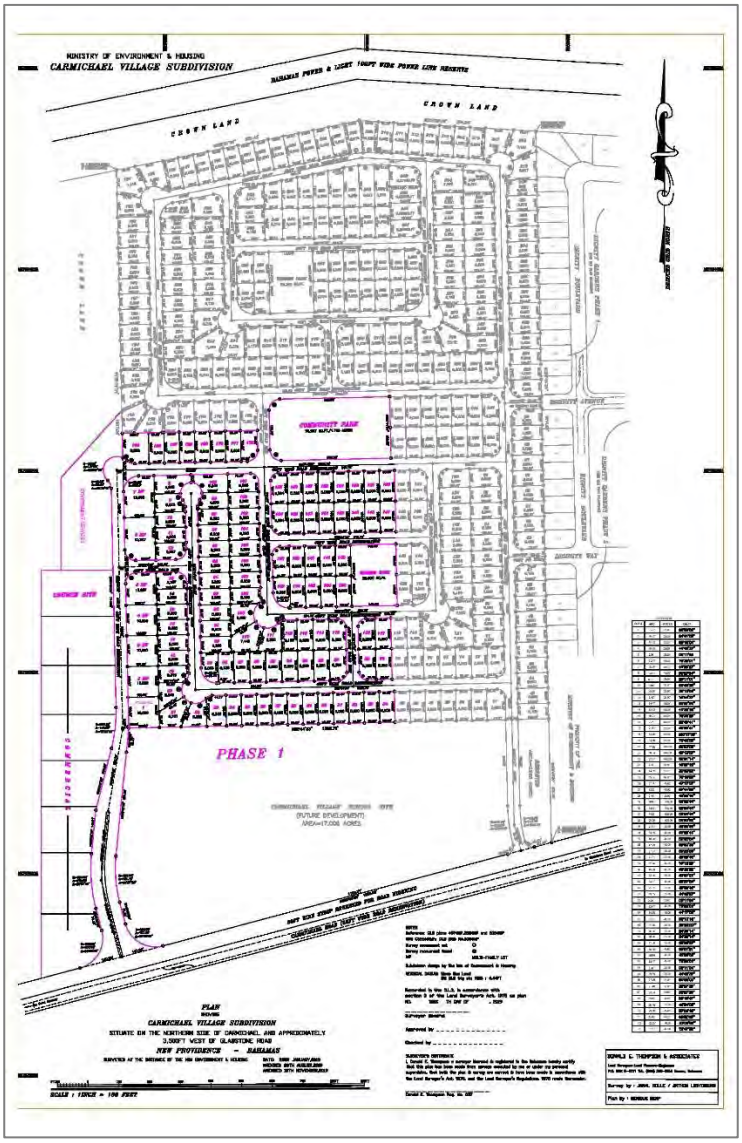


Figure – 4. *Depicting the recorded survey plan number 6049NP of the Carmichael Road Subdivision with the lot layout (highlighting phase one) and road reservations; and its relation to Carmichael Road and adjacent properties (Source: Department of Housing, 2021).*

Of the 76 lots designated to home constructions in Phase one, four model homes types were designed to be constructed on the said lots. The model types design, layout and square footage, are shown in ***Figures 5 – 8*** *(Source: Department of Housing, 2021)* below. Residential home constructions will be that of Post and Beam, and strip foundation (above grade level), which will provide added protection against flooding and standing water during heavy rainfall events or limited standing water during hurricanes. There are no plans for excavations/mining of quarry on the site. All vegetation cleared will be converted to mulch material to be returned to the area to be used on the Parks, soft scapes and foot trails in the Subdivision. A stock pile of mulch will also be made available for the residents usage. Additionally, the two Activity Parks (30,000 sq. ft. each) will also be landscaped using the mulch materials.

Figure – 5: Model #NRD 100 (2 Bed, 1 bath)

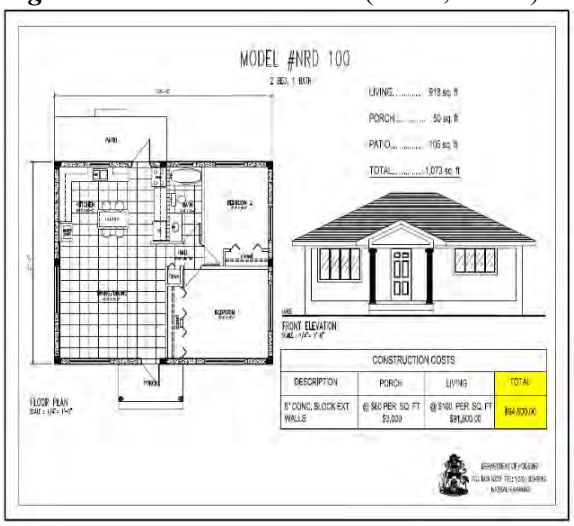


Figure – 6: Model # NRD 201 (3 bed, 2 bath)

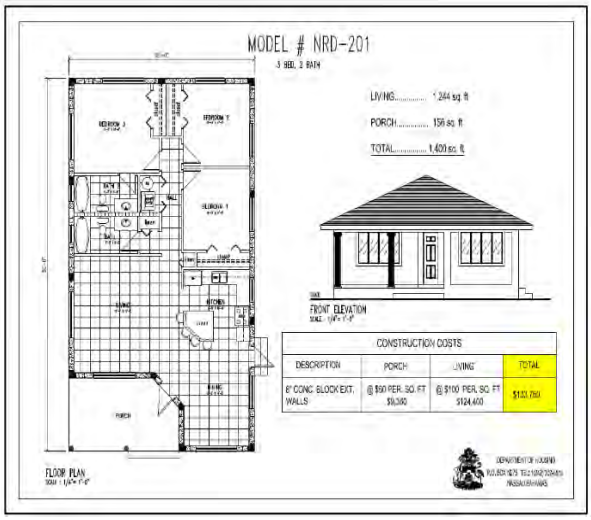


Figure – 7: Model #NRD 201- A (3 Bed, 2 bath)

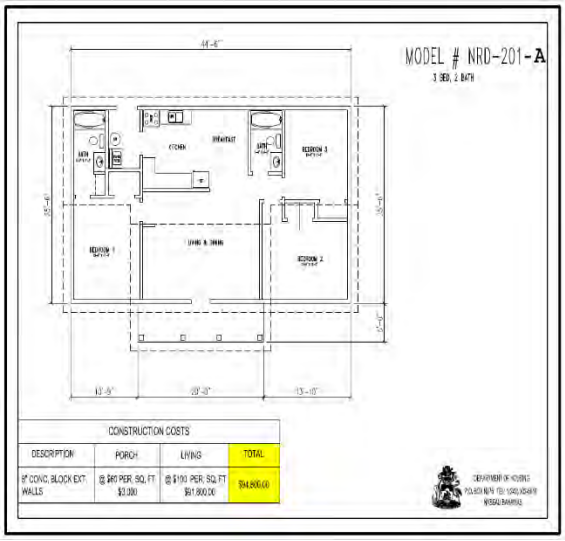
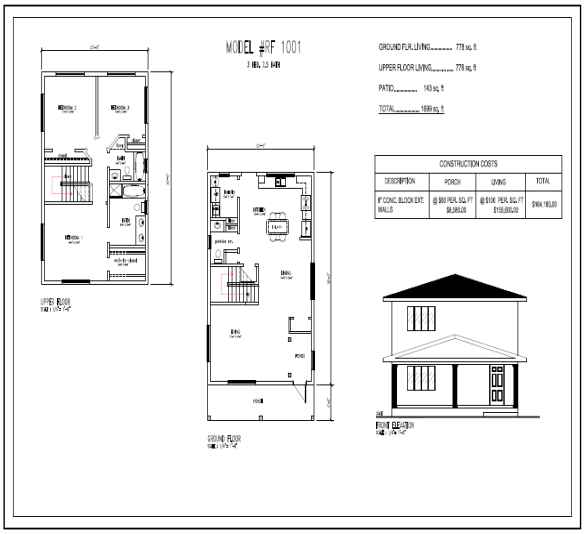


Figure – 8: Model #NRD 1001 (4 bed, 2 1/2 bath)



6.0 Physical and Biological Baseline

6.1 General Climate of the Bahamas

The Bahamas' climate is classified as sub-tropical, and is influenced by the sea, in particular the Gulf Stream to the west. The northern Bahama Islands experience cooler winters and higher amounts of rainfall compared to the southern islands, with drier conditions. According to Sealy, (2006), New Providence can expect some 57.1 inches of rainfall and 137 rain days annually, with highest amounts during the months of May to November. Temperatures are mild throughout the year and the average varies from the low 70s °F during the winter, to the low and high 80s °F during the summer; with extreme temperatures occasionally falling below low 60 °F or rising above the low 90s °F. Prevailing winds, coming from the Northwest in winter and from the Southeast in summer, lend a cooling influence to a generally humid atmosphere, with average wind speed recorded at eight (8) knots. The chain of islands lies within the Hurricane Belt, and hurricanes pose a great threat during the period

of June to November and have occasionally caused great human mortality and property destruction.

6.2 Geography

The Bahamas is an archipelagic nation comprising over 700 coral islands, cays and rocks, situated North West Atlantic Ocean, some 50 mile due east of the Florida Peninsula (USA), fifty miles due north of Cuba; spreading over some 100,000 square miles of ocean in a northwestern, south eastern direction. About 30 of the islands are inhabited. These islands are of limestone (calcium carbonates) formation, and soil is scarce, comprising a mixture of stone, sand, and silt and occasionally clay. The terrain is generally flat without rivers, but with occasional dunes and beach ridges sloping into plains and marshes. The maximum elevation is 206 feet above sea level (on Cat Island) and protection on the ocean side is supported by the third-largest barrier reef in the world (Tongue of the Ocean at Andros Island). Three forest vegetation types dominate the landscape, namely pine forest ecosystem in the northern (pine islands), broadleaved (coppice) forest ecosystem in the central and southern islands, and wetland mangrove forest ecosystem on the lee shores of selected islands.

6.3 Topography

The site for the Carmichael Village Subdivision consists of dominant pine forests ecosystem (pine trees with a mixed broadleaved understory), comprising rocky (honeycombed) limestone terrain and slightly elevated areas approximate three to six feet above mean sea level. Much of the terrain has been disturbed from its original natural state, which is evident by the extensive road network system constructed prior to the present new road network, and extensive illegal forest clearing, quarry and rock mining activities **(see Figure – 3,** above). The adjacent forest lands once comprised an extensive network of open trenches, utilized by the Water and Sewerage Corporation for the extraction of fresh water, some three to six feet below ground level. Hydraulic windmills and pumps were used to extract potable water. The fields are now abandoned, and evidence of trenches remain, even within the site for the subdivision.

6.4 Hydrological and Hydrogeological Resources

Caribbean pine forests are an indication of the presence of a healthy freshwater lens system. As the islands of The Bahamas are all made of very porous limestone, rainwater is filtered through the limestone and collects on top of the saltwater. This collection of water is known as the freshwater lens (GHYBEN-Hertzberg lenses). While pine forests can tolerate fire, they are incapable of tolerating saltwater. Hence, where there is a pine forest, there is the likelihood that fresh water is associated with it. It is important to note that given the proximity to the surface of the freshwater lenses 3 to 6 feet of the surface, over-extraction, illegal forest clearing and mining ***(see Appendix – G),*** pollution can lead to depletion of the resource, saltwater intrusion, and/or contamination.

It is highly likely that there will be negative impacts associated with the development of the subdivision (i.e. residential home construction, gas and oil from the use of tractors, heavy equipment, sewer system installations and electrical installations), and the possible contamination of the groundwater resources in the adjacent forest areas.

6.5 Hurricanes

The Bahamas is affected by hurricanes from June 1st to November 30th. The most recent hurricane to affect New Providence was Hurricane Matthew that made landfall in October 2016, and was classified as a Category 4 hurricane. The island experienced sustained periods of hurricane force winds, with the southern and eastern coastal areas experienced storm surges and coastal flooding up to eight (8) feet in places.

On 1st September 2019 Hurricane Dorian passed to the north of New Providence, in which the island received heavy rains and strong winds for several days, with flooding in low lying areas. The hurricane directly hit Marsh Harbour, Abaco with Category 5 Hurricane winds of up to 300 km per hour, and damaged or destroyed most buildings in the township. It then moved westerly impacting the East end of Grand Bahama, before turning north away from the Bahamas. The destruction was most severe and telling, with loss of human life, property, infrastructure, and natural vegetation.

Between 1859 and 2019, according to datasets from the Coastal Services Center (National Oceanic and Atmospheric Administration), seventy-two (72) tropical disturbances (tropical storms and hurricanes) have come within 50 nautical miles of Nassau, New Providence. This data suggests that New Providence is highly likely to receive a direct hit from a hurricane event in any given year.

6.6 Air and Noise Quality

According to the World Health Organization's 2018 Fact Sheet No 313, the air quality in the Bahamas is considered moderately unsafe. The most recent data indicates the country's annual mean concentration of PM2.5 is 17 µg/m3, exceeds the recommended maximum of 10 µg/m3.

The typical noise levels of highway traffic normally range from 70 to 80 dB (Decibels) at 15 meters (50 feet) from the highway. For comparison, a lawnmower, blender, and hairdryer are over 85 dB (Decibels). These levels affect many people, interrupting concentration, and limiting the ability to carry on a conversation. The New Carmichael Village Subdivision directly enters the highly trafficked Carmichael Road corridor as its main thoroughfare. This highway is highly trafficked during early peak morning and afternoon periods, augmented by its close proximity to the adjacent subdivision to the east (Dignity Gardens), Gladstone Road, other high density subdivisions on Carmichael Road (South) and the Lynden Pindling International Airport to the West.

During this subdivision development, it is expected there will be increases in both noise levels from heavy machinery and the air quality will likely decrease due to the expected dirt particulates that will filter into the atmosphere from construction works being undertaken in the subdivision.

6.7 Botanical Survey

6.7.1 Methodology and Analysis

Using the subdivision survey plan of proposed lot layout, a systematic grid approach was adopted to establish some seven line transects (equally spaced) on the entire 60-acre tract of land, using the survey lot boundaries as the baseline. A total of 27 temporary sample plots were equally spaced on the transect lines, with the computer generating six (6) randomly selected plots for the purposes of botanical data collection and analysis ***(see Appendices – D, F and J).***

Each sample plot center chosen for data collection was georeferenced (GPS coordinates), with a fixed radius of 15 meters (49 feet) established. Tally counts were made of all flora species identified (diversity) and categorized as trees, shrubs, and herbs. Overall estimation of species abundance was determined. Photographs were taken of selected species. The herbs grasses and vines were assessed based on percentage (%) ground cover of plot area.

Firstly, the tally count for each plant species was totaled per plot, then averaged over the six plots for an overall plot average, next the plot average per species was extrapolated to the per acre level, and finally to the 60-acre land parcel level. Associated summary tally counts (all plant species abundance) and percentages (%) is reflected in **Table – 1b**. The datasets of tally counts (abundance) of trees, shrubs and herbaceous plants are represented in **Figures 9 and 11** respectively. The respective plant species abundance in percentages (%) are shown in **Table 1b** and **Figures 10 and 12**. The percentage (%) ground cover for vines and grasses is presented in pie chart at **Figures 13**. **Tables 1a and 1b** also highlights the protection status and range of each species. Observations were also made of the associated wildlife, with the following species identified: dragon flies, monarch butterflies, Santa Claus spiders, and tadpoles within standing water and open trenches. *(Section – 8: Register of Environmental Effects*).

6.7.2 Botanical Species Identification

Table – 1b: Depicts the summary datasets of all plants species identification, (scientific and common names), with summary tally counts (numbers for trees, herbs and shrubs), percentages (vines and grasses), and the legal status of each species (i.e. range and protection status).

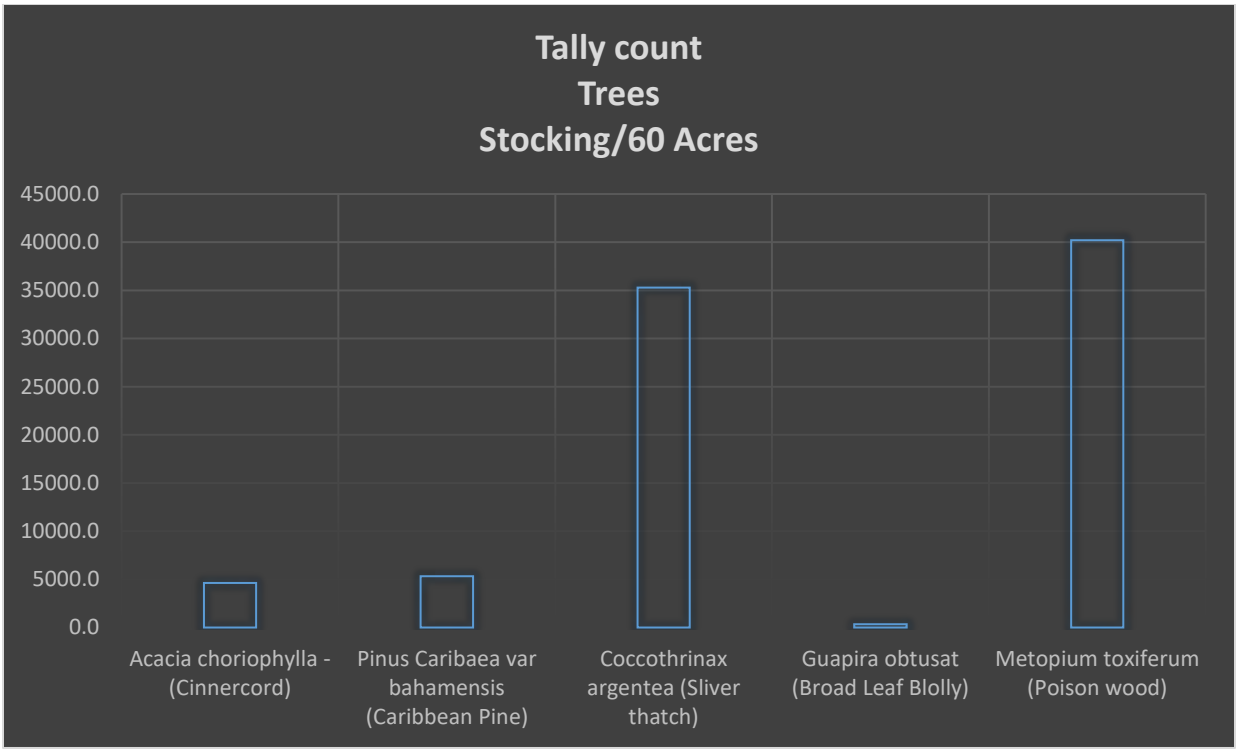


Figure – 9: *showing projected total tally counts of all trees within 60 acre land parcel.*

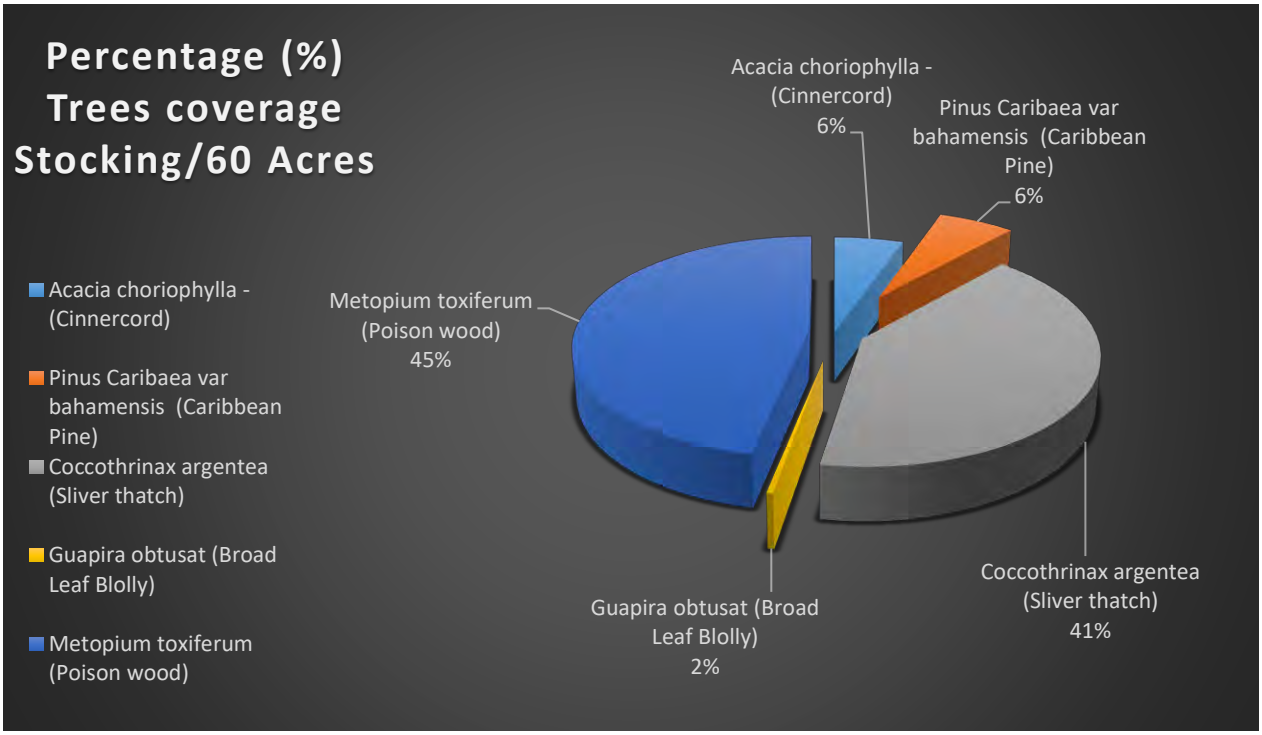


Figure – 10: *showing projected tree coverage (overstorey) abundance in percentages (%) for the 60 acres.*

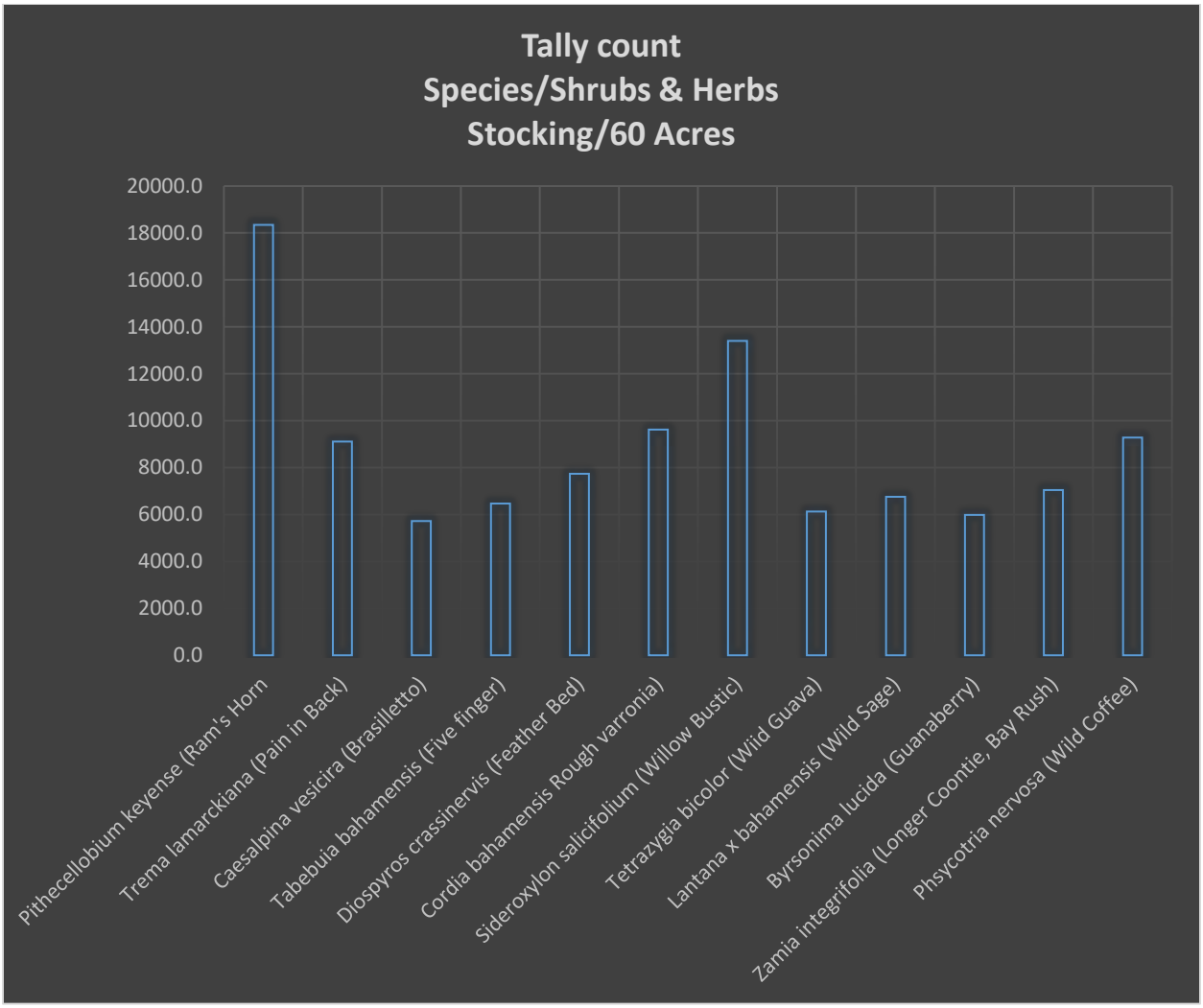


Figure – 11*: showing projected total tally counts for shrubs and herbaceous plant species (mid storey level) on 60-acre parcel.*

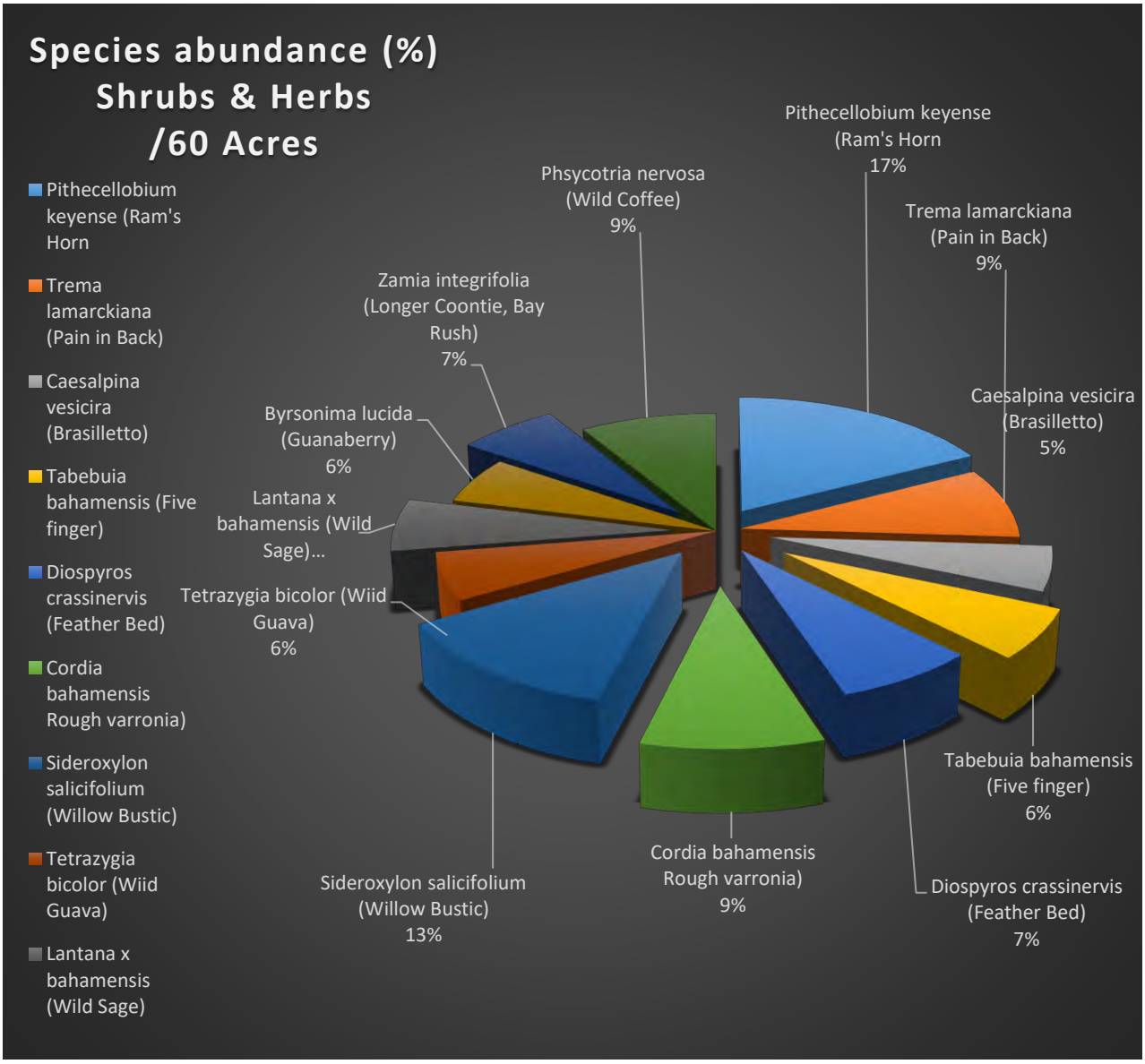


Figure – 12: *Showing shrubs and herbs abundance (Mid Vertical Ground Level) in percentages (%) for 60-acre site.*

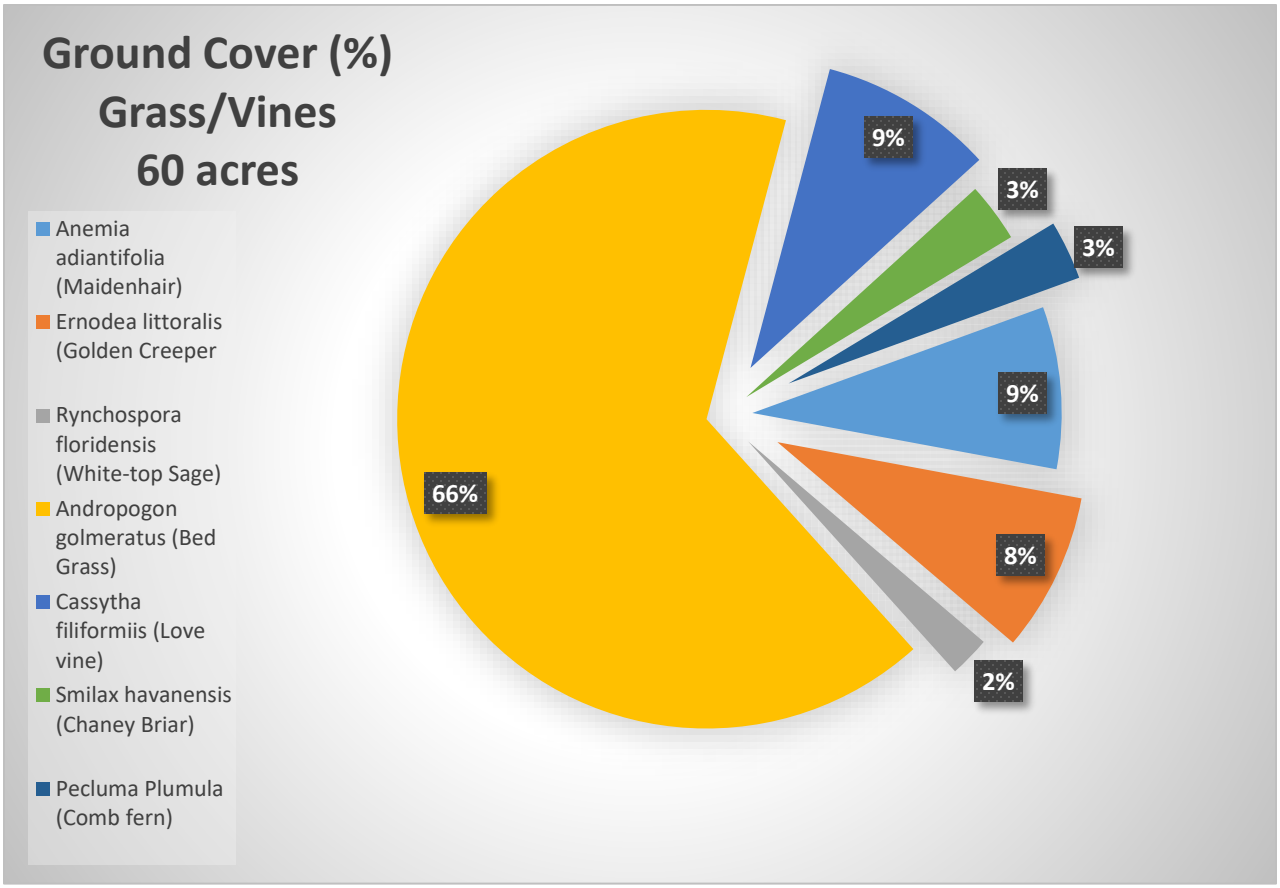


Figure – 13*: showing ground cover (%) (Lowest ground level) for the grasses and vines on 60-acre parcel.*

6.7.3 Vegetation Type

The pine forest ecosystem in the Bahamas has been classified into two types: wet pine barren or dry pine barren, according to Allan, (1986). The wet Pine Barrens are characterized by having water always within a few inches of the typical honeycombed rock strata, and by the occurrence of sabal palms; whereas in the dry pine forest the sabal palmettos are replaced with *Coccothrinax argentata* (silver thatch palm). Based on the species diversity results from this survey, there is an abundance of silver thatch palms (41%) of total, representing the second highest (%) coverage of all the upper storey trees.

6.7.4 Human Altered

As evident from ***Figures 2, and 3***, the 60-acre tract of land was once a highly productive dry pine forest ecosystem, and has since been altered significantly by human activity. In the first instance, the land has been scarified in the removal of its original primary pine forest for charcoal burning, quarry and rock mining, ***(see Appendices – D, E & G),*** and in recent years a subdivision road network was constructed as part of the original Carmichael Village Subdivision design.

The residual regrowth of the pine forest ecosystem is a direct consequence of the land remaining fallow for several years, followed by natural regeneration of the pine trees and associated understory vegetation. There is evidence of past forest fires, a consequence of human activity (charcoal burners), as charred pine tree stumps at the root collar and bracken fern are present, all indicators of past forest fires***. (see Appendix – E).***

6.7.5 Vegetation Map

Figures – 14a & b below depicts images representing a vegetation map of the 60-acre tract of land. Note the dominant upper storey species (juvenile Caribbean pine trees of up to 15 feet in height, and silver thatch palms) in contrast to the understory species of young shrubs and herbaceous plants. **Table -1** identifies the species diversity found on the site.

Figures – 14a & b: *depicting vegetation type (dry pine barren) comprising the 60-acre site proposed for the Carmichael Village Subdivision (note dominant pine tree over-story, with associated silver thatch palms and understory shrubs and herbaceous plants). (Source: Forestry Unit, 2021)*

6.7.6 Invasive Species

On the eastern boundaries of the 60-acre tract of land, adjacent to Dignity Gardens Subdivision, casuarina species *(Casuarina equisetifolia)* is found sparsely distributed in the area. ***(Figure – 15).*** It is worth noting that casuarina seeds are known to spread up to 11 miles in major storm events and have a very high rate of germination capacity. The species can colonize disturbed and fallow areas rapidly, and is recommended for removal and eradication from the subdivision development. The National Invasive Species Strategy for the Bahamas, 2013 calls for the eradication of all invasive species wherever they occur.

Figure – 15: *Casuarina species situated on the eastern edge of the 60 acre tract (tall tree on left side of image). Note, the species was not found within the 60-acre tract itself based on sampling methodology, but on the eastern margins. (Source: Forestry Unit, 2021).*

6.7.7 Protected Species

Table – 1b depicts the varied plant species found on the 60-acre site. Note is made that three (3) species are listed as protected under the ***Forestry (Declaration of Protected Trees) Order, 2021,*** namely Caribbean pine *(Pinus caribaea var. bahamensis*) (5,329 trees), Silver thatch palm (*Coccothrinax argentata*) (35,285 trees) at the upper-storey level and Brasiletto *(Caesalpinia vesicaria*) (5,728 trees) at mid storey-level. Having regard to an estimation of near to 86 % of the total vegetation on site to be removed due to subdivision development, a mitigation strategy is recommended to offset the protected species loss, and to enhance the biodiversity of the area. In this instance, three (3) areas of natural vegetation on site identified for public parks (i.e. 1.8 acre Natural Reserve Community Park in the center of Subdivision – Phase one, and two 30,000 sq. ft. Activity Parks) will be retained and developed as public green spaces **(See Figures 4 & 37).** A mitigation strategy is prescribed in *Section 11.2*.

Of significance with respect to the protected trees, where practical, a select numbers of silver thatch palm trees will be preserved by their translocation along the main road corridors and side verges of the Subdivision, and augmented with *Lignum* vitae plants (also a protected species). **(See Figure 37).**

Table – 1a & 1b: showing protective status, range, abundance, and range of each species identified on 60-acre site.

Table 1a: *Table key to species (Nativity vs. Regulation)*

TABLE KEY:	
Nativity	**Regulation**
N = Native	P = Protected
I = Invasive	U = Unprotected by local legislation
E = Established or common non-invasive	
L = Landscaping species	

Table 1b: *Showing species identification, tally counts and as a percentage and protective status.*

Scientific Name	Common names	Abundance (Tally)	Percentage (%) Coverage	Protective Status	Range
Trees (Upperstorey)					
Pinus caribaea var. bahamensis	**Caribbean Pine.**	5,327	6%	P	N
Acacia choriophylla	**Cinnecord**	4,640	6%	U	N
Coccothrinax argentata	**Silver Thatch Palm**	35,285	41%	P	N
Guapira obtusa	**Broad Leaved Blolly**	343	2%	U	N
Metopium toxiferum	**Poisonwood**	40,211	45%	U	N
Shrubs & Herbaceous plants (Midstorey level)					
Pithecellobium Keyense	**Ram's Horn**	18,353	17%	U	N
Trema Lamarckiana	**Pain in back**	9,108	9%	U	N
Caesalpina vesicaria	**Brasiletto**	5,728	5%	P	N
Tabebuia bahamensis	**Five finger**	6,473	6%	U	N
Diospytos crassinervis	**Feather bed**	7,733	7%	U	N
Cordia bahamensis	**Rough varronia**	9,923	9%	U	N
Sideroxylon salicifolium	**Willow bustic**	13,404	13%	U	N
Tetraxygia bicolor	**Wild guava**	6,129	6%	U	N
Lantana bahamensis	**Wild Sage**	6,759	6%	U	N
Byrsonima lucida	**Guana berry**	5,980	6%	U	N
Zamia integrifolia	**Bay rush (Coontie)**	7,046	6%	U	N
Phsycotria nervosa	**Wild coffee**	9,280	9%	U	N
Grass & Vines (lowest ground level)					
Anemia adianifolia	**Maidenhair**	NA	9%	U	N

Ernodia littoralis	**Golden creeper**		8%	U	N
Rynchospora floridensis	**White-top Sage**		2%	U	N
Andropogon golmeratus	**Bed grass**		66%	U	N
Cassytha filiformis	**Love vine**		9%	U	N
Smilax havanensis	**Chaney Briar**		3%	U	N
Pecluma plumula	**Comb fern**		9%	U	N

6.7.8 Overall Species Diversity

With respect to the overall species diversity, one can look at the **Table 1b** above, in concert with ***Figures - 14a & b*** to glen a clear picture of species identification, diversity and vertical positioning in the canopy ***(see also Appendices D & F).*** At the upperstorey level, the most prevalent species is the Poisonwood tree with 45% coverage (40,211 plants), followed by the thatch palms at 41% coverage (35,285 plants), Caribbean pine trees (5,323 stems), and cinnecord (4,640 plants) at 6% coverage respectively. Over time, (if land was not being developed as a subdivision) the pine trees would become the dominant overstorey species, with the other species evolving to the understory level status.

In the current midlevel canopy, the dominant species are the Rams Horn at 17% coverage, followed by the Willow bustic at 13%, with wild coffee, pain in the back and rough varronia at 9% coverage, respectively. All other species coverage averaged at 7% to 6% or less coverage (i.e. featherbed, wild guava, wild sage and guana berry).

At the lowest canopy level (ground cover), the dominant species is the bed grass at 66% ground coverage, followed by maidenhair, comb fern and love vine at 9% coverage, respectively. ***Figures 16 through 33*** *(Source: Forestry Unit, 2021)* below are images of the more abundant species at all three vertical levels (i.e. Overstorey, midlevel and ground levels).

It is important to note that the species identified on the site is typical of the species found in the adjacent pine forest ecosystem on New Providence ***(See Figure – 3 above),*** situated to the west of site.

Figure - 16: silver thatch palm (*Coccothrinax argentata)*

Figure – 17: Juvenile Caribbean pine *(Pinus caribaea var. bahamensis)*

***Figure – 18*:** Juvenile poisonwood (*Metopium toxiferum*

Figure – 19: Juvenile Cinnecord *(Acacia choriophylla)*

Figure – 20: Ram's Horn (*Pithecellobium Keyense)*

Figure – 21: Brasiletto *(Caesalpina vesicaria)*

Figure – 22: Wild coffee (*Phsycotria nervosa)*

Figure – 23: Wild guava (*Tetraxygia bicolor*

Figure – 24: Wild sage (*Lantana bahamensis)*

Figure – 25: Five finger *(Tabebuia bahamensis)*

Figure – 26: Bastard Stopper *(Petitia domingensis)*

Figure – 27: Coontie (*Zamia integrifolia)*

Figure – 28: Bracken fern *(Pteridium aquilinum)*

Figure – 29*: Orchid (Bletia purpurea)*

Figure – 30: Love vine (*Cassytha filiformis)*

Figure – 31: Maidenhair fern (*Anemia adianifolia)*

Figure – 32: Chaney briar (*Smilax havanensis)*

Figure – 33: Bed grass (*Andropogon golmeratus)*

6.7.9 Avian Assessment

An avian survey was conducted on 29th April 2021 to identify the presence, abundance and habitat utilization of avian species within the boundaries of the site.

6.7.9.1 Avian Survey Methodology

The Avian assessment comprised two hours of active avian observations. Species numbers were recorded in the abundance categories, Single (2-10) and many (11-100).The species recorded were then compiled for final abundance estimates. Status is based on International Union for Conservation of Nature (IUCN) classification.

6.7.9.2 Avian Survey Results (Species Observed and Diversity)

A total of nine (9) species were recorded during the survey (see Table – 2)

Table – 2: *Avifauna observed, Carmichael Village Subdivision site, New Providence, The Bahamas*

TABLE KEY:	
RANGE	**STATUS**
PRB = Permanent Resident Breeding	**LC** = Least Concern (Conservation - IUCN)
WRN = Winter Resident Non-Breeding	**NT** = Near Threatened (Conservation – IUCN)
SRB = Summer Resident Breeding	**E** = Endemic
	I = Introduced

SCIENTIFIC NAME	**COMMON NAME**	**STATUS/RANGE/ CONSERVATION STATUS**	**MASTER OBSERVATION**
Streptopelia decaocto	Eurasian Collared Dove	PRB/LC/**I**	F
Patagioenas leucocephala	White-crowned Pigeon	PRB/**NT**	F
Zenaida macroura	Mourning Dove	PRB/LC	F
Columbina passerina	Common Ground Dove	PRB/LC	F
Nesophlox evelynae	Bahama Woodstar Hummingbird	PRB/LC/**E**	S
Charadrius vociferus	Killdeer	PRB/LC	F
Falco columbarius	Merlin	WRN/LC	S
Tyrannus dominicensis	Gray Kingbird	SRB/LC	F
Mimus polyglottos	Northern Mockingbird	PRB/LC	F

6.7.9.3 Range

The range of a species is the geographic areas where the birds can be consistently found. For example, migrant birds have seasonal range, while restricted species remain on same island or in same region year-round.

- **Permanent resident Breeding**: refers to resident species that live and breed year-round throughout the Bahama Islands.

- **Winter resident Non-breeding**: refers to the annual non-breeding fall/winter (generally October to April) migrants to the Bahamas from North America.

- **Summer resident Breeding**: refers to migrants that breed in the Bahamas during the summer from April to October and spend the rest of the year in other regions.

- **Endemic species**: are birds that exist only in the Bahamas. Note that the Bahama Woodstar Hummingbird *(Nesophlox evelynae*) was recorded at the site.

6.7.9.4 Conservation Status

a. Protected Species

All species observed are protected under the Wild Birds Protection Act (Statute Law of the Bahamas, Chapter 249).

b. Species of Concern

"Near Threatened"(NT) by the IUCN classifies a species that may be considered *threatened* with extinction in the near future, although it does not currently qualify for the *threatened* status.

The White-crowned Pigeon *(Patagioenas leucocephala*) designated a Near-threathened status by the IUCN was recorded during the investigations.

c. Endangered Species

None of the species recorded are classified as endangered.

The Site surveyed consisted of human disturbed habitat of regenerating dry pine forest over-storey, with scrubland (coppice) under-storey species. The majority of the bird activity was recorded along the edges of the trails and overhanging nearby utility lines. The previously cleared/disturbed regenerating habitats lacked mature fruiting plants. The lack of bird species observed can be attributed to several reasons:

1. Lack of food sources due to human disturbed habitat;
2. Seasonal drought inhibiting the vegetation from blooming – immature fruit/berries observed;
3. Disturbance caused by workers/machines in the area;
4. Most of the non-breeding migrants have returned to North America to breed.

The combination of common resident bird species along with a few species of "regular fall/winter non-resident breeding migrants and a summer breeding migrant' recorded on the site confirmed they have adapted to the disturbed habitat and utilize all the resources.

Figures 34 through 36 *(Source: Forestry Unit, 2021*) below depicts noted bird species observed on or near the Subdivision site, and within range of photographic opportunity.

Figure 34: Northern Kingbird *(Mimos polyglottos)*

Figure 35: Eurasian Collared Dove *(Sereptelia decaocto)*

Figure 36: Killdeer *(Charadrius vociferus)*

6.8 National Parks

New Providence Island has a total of five (5) National Parks, which includes the Clifton Heritage Park managed by the Clifton Heritage Authority; the Retreat, the Primeval Forest National Park, Bonefish Pond National Park, and Harold & Wilson Ponds National Park, under the management of the Bahamas National Trust (BNT).

The Clifton Heritage Park located on the western tip of New Providence, protects 250 acres of intact broadleaved coppice forest, where there are remnants of the historical and cultural heritage of three important groups that had an influence on the country: the Lucayans, the Loyalists and Africans.

Primeval Forest National Park protects 7.5 acres of undisturbed old-growth broadleaved coppice forest and is representative of the early hardwood forests of the Bahamas. Located in southwestern New Providence.

Bonefish Pond National Park is mangrove ecosystem on the shores of Southern New Providence, Bonefish Pond protects 1,235 acres of important coastal wetlands.

Harrold & Wilson Ponds National Park protects 250 acres of vital wetland habitats for birdlife on New Providence. Surrounded by development, these freshwater wetlands are internationally recognized as Important Bird Areas. Harold & Wilson Ponds National Park is currently closed to the public due to damaged boardwalks.

The Retreat is an area of eleven (11) acres botanic gardens, showcasing rare and exotic palms, cycads and intact native broadleaved coppice ecosystem and flowering plants, located on Village Road. The site once housed the headquarters of the Bahamas National Trust.

6.9 Socio-Economic

6.9.1 Population

According to the National 2010 census, the population of The Bahamas was 351,461. Residents included all persons regardless of their legal status, with a growth of 15.8 % over the past decade. New Providence experienced the largest increase in population and is the most populous island in The Bahamas, containing more than 70% of the total population. It

is the location of the national capital city of Nassau, whose boundaries are coincident with the island and had a population of 246,329, with the latest estimate (2016) of 274,400.

Table – 3: *Statistics on population in the Bahamas (2010 Census data) Department of Statistics*

Island	**Population**		**Change**	
Years	2000	2010	Actual	%
All Bahamas	303,611	351,461	47,850	15.76
New Providence	210,832	246,329	35,497	16.84

6.10. Cultural Resources

Bahamian culture is an amalgam of its African and European heritages. It has also been influenced by the peoples of the Caribbean and the Americas. Nassau, the Capital, situated on New Providence was originally known as Charlestown. It was laid out and renamed Nassau in 1695 by Nicholas Trott, the most successful Proprietor Governor, in honor of the Prince of Orange-Nassau who became William III of England. Because of its natural deep harbor, New Providence was singled out as the most suitable seat for Government.

6.10.1. Bahamian Arts and Crafts

The arts, including painting, sculpture, and photography, as well as crafts, have blossomed several prominent institutions devoted to their cultivation. The Dundas Centre for the Performing Arts, in Nassau, presents dramas, musicals, and dance performances. Art and crafts can be seen at a variety of galleries, including the National Art Gallery, located in a mansion overlooking Nassau Harbour. The Department of Archives preserves public and private records and makes them accessible to the public. The Antiquities, Monuments and Museums Corporation regulates and controls antiquities, monuments, museums, and archaeology. The Bahamas Historical Society, in Nassau, operates a museum and publishes a scholarly journal.

6.11. Transportation

The Carmichael Village Subdivision will be accessed from Carmichael Road East-West corridor to the South. The other major road to the East of the subdivision is Gladstone Road, but there is no direct access from the Proposed Carmichael Road Subdivision. Public buses traverse Carmichael Road, to provide public busing services to the public who may need transportation directly to Downtown Nassau and other points of interest. There is the likelihood of increase traffic congestion in the immediate area once the subdivision is totally populated, and a traffic flow study may be required with recommendations for some remediation action for implemented (e.g. Carmichael road realignment and widening, with turning lanes into subdivision).

6.12. Utility Provisions

6.12.1 Sewer Services

The Department of Housing advised that the subdivision will be serviced by the existing sewer system by a tie into the Dignity Gardens Subdivision sewer line. Tying into the existing sewer system at Dignity Gardens, will aid in protecting and limiting any impacts to the existing ground water resources.

6.12.2 Potable Water

Each lot will be serviced by underground water piping provided by the Water and Sewerage Corporation.

6.12.3. Electricity

Overhead electrical lines will be erected to provide for tie into the main electrical grid system, with electrical supply by the Bahamas Power & Light Company.

6.12.4. Roads

The Subdivision has two main road accesses from Carmichael Road to the South, with an entire network of secondary roads layout to grade, constructed in accordance with the specifications and standards of the Ministry of Public Works. See **Figures – 3 & 4,** above. These main road corridor verges will be planted with translocated silver thatch palms and lignum vitae tree species. **(See Figure – 37).**

7.0. Environmental Laws, National Environmental Policies, and International Conventions

7.1. Environmental Laws of the Bahamas

Environmental Law, Regulation and Policy	Summary
Antiquities, Monuments and Museum Act, 1998	"An Act to provides for the preservation, conservation, restoration, documentation, study and presentation of sites and objects of historical, anthropological, archaeological and paleontological interest, to establish a national Museum, and for matters related therewith…"
Disaster Preparedness and Response Act, 2006	"An Act to provide for the effective organization of the mitigation of, preparedness for, response to and recovery from emergencies and disasters…"
Road Traffic Act, 1962	"An Act to declare, amend and codify the law relating to motor vehicles, and to provide for the regulation of traffic on roads and of motor vehicles…"
Agriculture and Fisheries Act, 1964	"An Act to provide for the supervision and development of agriculture and fisheries in the Bahamas…"
Fisheries Resources (Jurisdiction and Conservation) Act	An to Act to make provision with respect to the conservation and management of the fishery resources of the Bahamas and to extend the limits of the jurisdiction of the Bahamas over such fisheries resources and for matters connected therewith…"
Water and Sewerage Corporation Act, 1976	An Act to establish a Water and Sewerage Corporation for the grant and control of water rights, the protection of water resources, regulating the extraction, use and supply

	of water, the disposal of sewage and for connected purposes…"
Building Regulations, 1971	An Act to regulate the construction, altercation and repair of buildings, provide for the re-instatement or removal of dangerous or dilapidated buildings, to authorize the publication of a building code and for purposes connected therewith…"
Environmental Planning and Protection Act, 2019	An Act to establish the department of environmental planning and protection; to provide for the prevention or control of pollution, the regulation of activities, and the administration, conservation, and sustainable use of the environment; and for connected purposes"
Environmental Planning and Protection (Extension of Application) Order, 2020	An Order to extend the Environmental Planning and Protection Act, 209 throughout the territory of the Bahamas, including every island and cay and to define procedures for proposed projects, monitoring and compliance, and the certificate of environmental clearance.
Environmental Impact Assessment Regulations, 2020	The regulations describe the procedure for proposed projects and requirements to apply and receive a Certificate of Environmental Clearance from the Department of Environmental Planning and Protections.
Bahamas Protected Areas Fund Act 2014	The Act establishes the BPAF as a Fund to ensure sustainable financing for protected areas in the Bahamas. The Fund allows for the solicitation of funds and donations from the Caribbean Biodiversity Fund, to fund protected areas in the country.
Conservation and Protection of the Physical Landscape of the Bahamas Act, 1997	An Act to make provision for the conservation and protection of the physical landscape of the Bahamas. The Act contains pats regarding administration, regulation of excavation and landfill operations, provisions governing dangerous excavations, landfill operations, quarries or mines, zoning of the Bahamas for the purposes of quarrying and mining operations, and general entries.
Environmental Health Service Act, 1987	"An Act to promote the conservation and maintenance of the environment in the interest of health, for proper sanitation in matters of food and drink and generally, for the provision and control of services, activities and other matters connected therewith…"
Environmental Health Services (Collection and Disposal of Waste) Regulations, 2004	Section 18 speaks to removal of construction waste and section 19 speaks to industrial waste disposal.
Forestry Act, 2010	An Act to provide for the conservation and control of forests and for matters related thereto;
Forestry Regulations, 2014	Provides for the application for a permit to harvest protected trees
Forestry (Amendment) Regulations, 2021	Amends the Forestry Regulations, 2014 to provide for reduced to be payable for royalties for the granting of licences, permits for the salvaging of damaged forest due to natural disasters, hurricane, or tornados.
Forestry (Declaration of Protected Trees) Order, 2021	An Order which increase the list of trees protected from a previous eleven (11) to some one hundred and twenty seven (127) trees/plants.
Planning and Subdivision Act 2010	The Act governs development and planning, both from a terrestrial and marine landscapes. It applies to both New Providence and the Family Islands and the Port area of Grand Bahama. While the Act is comprehensive, no formal land use plans have been developed
Wild Animals Protection Act 1968	The Act prohibits the taking, capturing, or hunting of any wild animal without a permit.

Bahamas Public Parks and Public Beaches Authority 2014	The Act allows the authority to control, plan, design, develop, administer, manage and maintain public parks and public beaches; to conserve their natural beauty and topography, propagate, protect, and preserve animals, plants and other organisms in those areas.
Bahamas National Trust Act 1959	The Act provides the BNT the mandate to promote the preservation of lands, buildings, underwater areas, and areas of natural interest. The Act also empowers the BNT to identify sites for protection and to administer areas declared protected; and manages national parks.
Wild Birds Protection Act 1959	The Act prohibits the taking, capturing, and hunting of any wild bird without a permit. It protects birds and eggs during the closed season. The Act also permits the Minister to establish wild bird reserves.

7.2. National Environmental Policies

Relevant National Environmental Policies	Summary
National Policy for Adaptation to Climate Change 2005	The policy outlines a framework to meet the goals and objectives of the United Nations Framework Convention on Climate Change (UNFCCC). Where the Bahamas committed itself to reducing greenhouse gases and address the impacts of climate change
National Invasive Species Strategy for the Bahamas, 2013	The initial policy was drafted in 2003, but subsequently updated in 2013, as part of a GEF funded project (MITIASIC) Mitigation the Threats of Invasive Alien Species in the Insular Caribbean; and sets out a management strategy for the control and eradication of invasive species
National Biodiversity Strategy and Action Plan, 1999	The Action plan calls the Bahamas to conserve biodiversity and pursue sustainable development. It further highlights the role of biodiversity in the social and environmental context and recommends measures to ensure its compatibility with future developments.

7.3. International Conventions of Relevance

International Convention/Organization	Summary
Cartagena Convention. Ratified: June 24, 2010	The Convention provides for the legal framework for cooperation in the wider Caribbean region. Three technical agreements apply: • Protocol for co-operation in combating oil spills. • Protocols for specially protected areas and wildlife (SPAW); • Protocol concerning pollution from land-based sources and activities (LBS).
Convention on Biological Diversity. Signed: June 12, 1992	The convention has three main goals: • Conservation of biodiversity. • Sustainable use of components of biodiversity. • The fair and equitable sharing of the benefits arising out of the utilization of genetic resources (ABS)

Convention on Wetlands of International Importance (RAMSAR Convention) Signed: June 7, 1997	Known as the RAMSAR convention. The convention provides the framework for the international protection of wetlands as contributor for avifauna which do not adhere to international borders.
Convention to Combat Desertification and Drought. Signed November 10, 2000	The Convention provides for sustainable development by addressing social and economic issues that directly impact land degradation.
United Nations Framework Convention on Climate Change. Signed: June 1992 Kyoto Protocol Signed: April 9, 1999 Paris Agreement Ratified: August 22, 2016	The Bahamas is a signatory to this convention. It establishes a framework with the aim to stabilize atmospheric greenhouse gases. The Kyoto Protocol was developed under the UNFCCC to provide emissions targets and timelines for developed countries. The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.

7.4. Government Departments and Local Non-Governmental Organizations

Table - 4 below indicates the agencies that the Department of Housing will be collaborating with in the development of the Carmichael Village Subdivision, from its planning phases to infrastructural development, home construction, and to Natural Park Preserves maintenance and development.

Table – 4: *Relevant agencies collaborating with the Department of Housing for acquiring necessary approvals and permits for subdivision development.*

• Ministry of Public Works (MPW)
• Department of Public Works (DPW)
• Ministry of the Environment and Housing (MOEH)
• Forestry Unit (FU)
• Department of Environmental Planning and Protection (DEPP)
• Department of Physical Planning (DPP)
• Department of Environment Health Services (DEHS)
• Water and Sewerage Corporation (WSC)
• Bahamas Power and Light Company (BPL)
• Public Parks and Public Beaches Authority (BPPPBA)

Register of Environmental Aspects			
Aspect	**Ecological /Social Values**	**Impacts**	**Recommendations for Mitigation and Management**
Botanical	The vegetation on the 60-acre site is that of a dry barren pine forest ecosystem. With the dominant upper level species being the Caribbean Pine (*Pinus caribaea var. bahamensis*). Understory species includes a diversity of dry broadleaved coppice species, including silver thatch palms, poisonwood, cinnecord, brasiletto, wild coffee, five finger, wild quava, wild sage, bastard stopper, Bracken fern, love vine, orchids, and the beard grasses. The site was previously a dense pine forest, but was human altered, to the extent that the land was once cleared over for the development of a government subdivision. A subdivision road network was previously constructed some years ago, and the site was left abundant. Secondary pine forest regeneration has taken place, with the associated understory species emerging. Road works have commenced within the subdivision as the road infrastructure development works has been reactivated, using the previous road layout and design. Botanical surveys were undertaken over the course of ten (10) weekdays, commencing 8th through 19th February 2021. Three plant species were identified as protected under the Forestry (Declaration of Protected Tree) Order, 2021; namely: Caribbean pine, Silver Thatch Palm, and Brasiletto.	There will be significant impacts to the natural vegetation associated with the pine forest ecosystem. It is expected that between 85 to 90% of the existing vegetation will be loss and removed once road network is completed and the construction of homes begin. Land clearing and site preparation in the use of heavy equipment and machinery will also contribute to increase noise pollution and ambient air quality, impacting the adjacent Dignity Gardens subdivision to the east; and other built up communities to the south of the development.	1. The retention of the three (3) public green spaces, (within subdivision design) be developed as natural public recreational parks. 2. Remove of all invasive species along subdivision boundaries. 3. Encourage each homeowner to plant at least five (5) native plant species within boundaries of properties (place requirement within conveyance document). 4. Translocate selected protected tree species (silver thatch palms) along main road entrance, verges and corridors to the subdivision. A Permit for the harvesting and relocating of protected trees would need to be sought from the Forestry Unit. 5. Adopt appropriate air quality and dust mitigation strategies (BMPs) to maintain standard air quality and noise levels during subdivision development. 6. Adopt site and safety and Health protocols (PPE). 7. All cleared forest vegetation to be recycled as mulch and returned to subdivision

			to landscape Activity Parks and road verges.
Avian	During the avian survey nine (9) known bird species were identified, namely: the endemic Bahama woodstar hummingbird, Eurasian collared Dove, White crowned pigeon, Mourning Dove, Common ground Dove, Killdeer, Merlin, Gray Kingbird, and the Northern Mockingbird. All species are protected under the Bahamas Wild Birds Protection Act (Chapter 249). However, none are classified as Endangered Species by the IUCN.	Removal of significant natural vegetation will reduce the presence of resident and non-resident bird life for foraging and breeding within the natural pine forest habitat.	1. Retain the three (3) public parks sites within the subdivision as natural corridors of native plant species; to attract birds and associated wildlife. 2. Homeowners be encouraged to plant native flowering plants to attract bird species. 3. Air quality and dust mitigation (BMPs)
Underground Water resources (aquifers)	Subdivision infrastructural, road engineering construction and home building works will likely cause some contamination of the underground freshwater resources on site. The use of heavy machinery will likely result in some fuels and oil emissions entering the ground and contaminating the ground water.	Fuels and oils spillage from the use of heavy machinery and associated equipment will likely pollute ground water table	1. Use of sewer system for sewerage disposal, rather that septic tanks. 2. Ensure BMPs for fuel and oil clean up during construction activities (i.e. road, infrastructure and building works). 3. Use of engineering controls for storm water runoff along road corridors. 4. Ensure buildings are constructed above road grade levels in accord with Ministry of Public Works standards.
Biological wildlife	During the course of the ecological survey, the following wildlife were observed: dragon flies, monarch butterflies, Santa Claus spiders, tadpoles within standing water and open trenches.	Removal of the natural habitats and vegetation by human alterations (subdivision development) will reduce the abundance and diversity of the associated wildlife.	The retention and enhancement and development of the three (3) public green spaces, (within subdivision design) as natural public recreational parks and biological corridors, would encourage biodiversity enhancement and conservation (natural wildlife habitats).

9.0 Environmental Management

Environmental management integrates environmental policies and planning initiatives to address various environmental issues that are affecting an area. Environmental management attempts to prevent potential adverse environmental impacts, and to identify appropriate resolutions.

Appropriate environmental management seeks to avoid, minimize and control adverse impacts to the land, marine and atmospheric environments, human health and safety. Where it is not possible to avoid adverse impacts, then best management practices should be utilized to mitigate environmental and human harm.

The Environmental Management Plan (EMP) will detail the best environmental and safety practices for the subdivision development, in all phases.

9.1 Draft Environmental Management Plan Terms of Reference

I. Executive Summary
II. Introduction
    a. Purpose
    b. Scope and Content
III. Project Description
    a. Geographic Location
    b. Master Plan
IV. Environmental Regulatory Bodies and Laws
    a. Regulatory Bodies
    b. National Laws and Regulations
    c. International Organizations
V. Environmental Management Organization Structure
    a. Organizational and responsibilities Chart
    b. Environmental, Health and Safety training for constructional and operational staff
VI. Register of Significant Environmental Aspects
VII. Management Plan and Mitigation Strategies
    a. Terrestrial Resource management
    b. Air and noise quality
    c. Water quality Management
    d. Spill Management
    e. Sewerage management
    f. Solid Waste Management
    g. Hazardous Waste Management
    h. Emergency, Health, and safety
        i. Training
        ii. Accidents
        iii. Covid-19 awareness.
VIII. Public Consultation, Education, and communication
IX. Environmental monitoring and Reporting
    a. Planned environmental monitoring (checklist)
X. Conclusion
XI. References
XII. Appendix

10.0. Public Interactions/Communications

The Government of the Bahamas through the Ministry of the Environment and Housing – Department of Housing, publicly announced in 2019 its intention to develop an affordable housing subdivision in the Carmichael Village area of New Providence.

Groundbreaking ceremony for the Carmichael Village Subdivision took place in January 2020, with the Prime Minister, the Most Hon. Hubert A. Minnis officially breaking ground, and spoke to the particulars of the subdivision. Television and news coverage allowed for public information on the plans for the development of the subdivision in four phases. An information pamphlet was also produced to bring awareness to the history, vision, and mission of the Department of Housing.

A public consultation meeting will be held in compliance with the Environmental Impact Assessment Regulations, 2020, thus allowing the public to give feedback, and arise any environmental concerns associated with the subdivision.

The public has been invited to make applications to the Department of Housing through its online portal, to qualify for house assignments and lot purchases, and to seek mortgage consideration from the Bahamas Mortgage Corporation, or any other approved lending agency.

11.0. Recommendations and Mitigation Strategies

11.1 Methodology

All significant impacts of the expected project activities were determined. Mitigation strategies relative to a specific impact was developed. It is anticipated that a more detailed mitigation and management plan will be developed in the Environmental Management Plan (EMP), following the outlined at Section 9.1 above. A resident project environmental manager will need to be identified to provide oversight and ensure compliance.

11.2 Terrestrial Resource Management

Based on the design of the subdivision, ***(see Figure 3 & 4),*** road layout, and lot subdivision with subsequent housing construction, it is anticipated some 86% of the total vegetation cover on the 60 acres parcel of land will be removed. This removal is significant in habitat loss for the resident avian species, associated wildlife, coupled in the removal of thousands of stems of plant species, inclusive of three protected species (juvenile Caribbean pine trees, silver thatch palms and *brasiletto*); and other indigenous plants.

To offset the loss of this dynamic secondary growth pine forest ecosystem, the following mitigation and enhancement strategies are strongly recommended:

1. Remove at least 2.5 % of the silver thatch palms (representing some 4.16 acres of total vegetation crown cover) and translocate them along the main road verges and secondary

roads into the subdivision (to include *Lignum vitae* species) as part of the natural landscape; and to include other select native flowering plants to serve as biological corridors for avian species, **(see Figure – 37)**. To facilitate the protected trees removals, a Permit to harvest protected trees will be secured from the Forestry Unit.

2. Maintain the three (3) designated public park spaces as natural spaces (totaling 3.18 acres or 5.3% of total vegetative cover) and design as natural recreation parks. Noted protected trees on the sites (i.e. Caribbean pine trees, brasiletto, and silver thatch palms) will be incorporated within the landscape design of the Nature Park. The parks to incorporate low impact nature trails, interpretative signs near species of interest along nature trails, and provide seating areas at designated shaded locations within the parks. These green spaces can serve as natural laboratories of learning/education with respect to the forest environment to the residents of the subdivision. These natural areas can be augmented with other native species that attract the avian community, and associated wildlife.
3. To place in every lot sale agreement/conveyance where each purchaser must plant a minimum of five (5) native plants species (inclusive of two fruit trees) on their properties (125 sq. ft. average coverage per lot, based on average lot size of 5,200 sq. ft.), upon completion of home construction. This represents some 1.02 acres or 1.8% total vegetative coverage. Additionally, to encourage homeowners to plant native flowering plants to attract birds.

Note that **Figure 37** *(Source: Department of Housing, 2021)* below depicts the recorded survey plan number 6049NP of the Carmichael Road Subdivision. It shows the lot layout (highlighting all four phases), road reservations and proposed locations for transplanted palms and areas to be preserved as natural spaces or recreational parks. Such mitigation strategies must be coordinated with the Forestry Unit's regulatory requirements for mitigation protected trees removals (i.e. Permit to harvest protected trees).

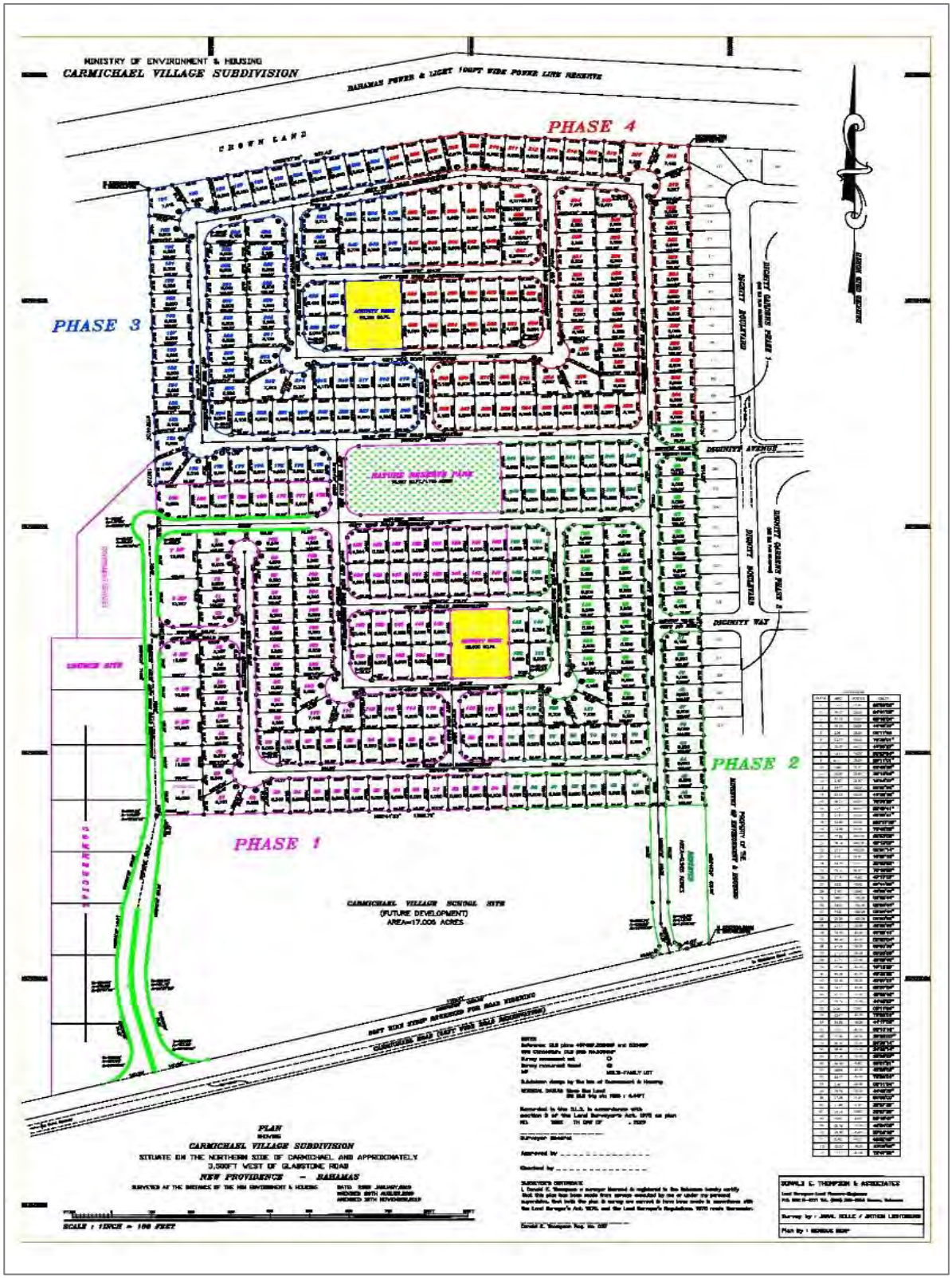


Figure – 37: *Depicting the recorded survey plan number 6049NP of the Carmichael Road Subdivision with the lot layout (highlighting all four phases), road reservations and proposed locations for transplanted palms and areas to be preserved as natural spaces or recreational parks (Source: Department of Housing, 2021).*

11.3 Emergency Health and Safety

All personnel recruited to work in the development of the subdivision activities must have access to sanitary conveniences, wear personal protective equipment (PPE) and have potable water. Some basic PPE accessories required, include steel toed boots, safety vests, hard hats, gloves, and eye protection. Staff must undergo basic training in safety and health risks at work, and how to use PPE properly and effectively. First aid kits must be made available in the event of minor injuries. Open trenches and utilities that may be hazardous should be marked with caution flags; and signage should be used to identify hazards to the public.

11.4 Solid Waste and Sewerage Management

Project waste streams must be identified, and provisions made for timely removal. Work areas should be free from litter and construction debris. This will call for the erection of a designated dumpster or bin, with fixed schedules for disposal at a facility designated by the Department of Environmental Health Services (DEHS).

Sanitary receptacles should be emptied at regular intervals by a reputable sewage disposal company. Any hazardous waste, if identified, to be stored and disposed of in accordance with DEHS standards. As the subdivision will incorporate a sewerage system, all sewerage infrastructure will be tied into the nearest lift station at Dignity Gardens to the east of the subdivision, thus allowing for the orderly treatment of the same, and disposal.

Vegetation materials clearance and removals will be mulched and return on site to reuse within parks and other areas where soft scape and footpaths are desired. A stock pile will also be made available for residents.

11.5 Air Quality and Noise Attenuation

During infrastructure works and home construction, the ambient air quality will be impacted. Appropriate measures should be implemented to maintain ambient air quality, as fine dust sediments are expected to become airborne during the dry season. Dust mitigation strategies to include periodic street cleaning and damping during road construction. Additional strategies to include the use of vehicle speed restrictions with subdivision, and the use of tarpaulins on dump trucks.

With respect to noise prevention and mitigation, reduction begins at the source, and may include installation of suitable muffler on engine exhaust and compressor parts, use of equipment with lower sound power levels, and limiting hours of operations when certain equipment can be used. Noise levels in residential areas (07:00 – 22:00) should not exceed 55 Laeq (dBA) (*Source: IFC Noise Level Guidelines).*

11.6 Forest Fires and Hurricane Risks

The 60 acres site for the subdivision development, being adjacent to a pine forest ecosystem, poses risks in the incidences of wild forest fires. Evidence determined during survey provided clear signs of past fires ***(see Appendix – E)***. The subdivision must have fire hydrants placed strategically within the subdivision, to allow easy access by the Fire Brigade, if there is a wildfire, adjacent to subdivision for ease of extinguishment. The North and Western boundary of the subdivision should be constructed a 20 feet wide road reservation, to act as a buffer between the pine forest and subdivision, to reduce the chance for forest fire spread into the subdivision from adjacent pine forest.

New Providence Island lying within the hurricane belt (season begin June 1st to 30th November), there is the likelihood for tropical disturbances, and hurricanes up to a category 5 to make periodic landfall, bringing heavy rainfall, storm surges and high winds. These events are likely to impact the subdivision with possible flooding. The drainage system planned for the subdivision must be able to effectively allow for easy runoff during heavy rainfall.

11.7 Invasive Species removal

In accordance with the Bahamas Invasive Species Policy, invasive species are designated for eradication. On this site, the invasive species casuarina was identified, situated along the eastern boundary. It is expected that all casuarinas will be removed with hand tools and converted to mulch/compost for reuse within parks where soft scape and footpaths are desired.

11.8 Environmental Monitoring

Continuous and consistent site inspections, along with strong communication between environmental monitor and the Contractors is paramount to ensure compliance with recommended environmental mitigation strategies. The EMP, with its monitoring checklist is the mechanism which serve to document onsite practices, provide recommendation, and make corrective actions, where necessary.

It is anticipated that monthly reports will be provided to the DEPP and will focus on all aspects of the mitigation strategies, which is paramount to the success of the project and its deliverables.

12.0 Contributors

Lead Authors:	Christopher Russell	-	Director of Forestry (FU/MOE&H)
	Andrew Curry	-	Forest Assistant III (FU/MOE&H)
Contributors:	Ms. Predenza Moore	-	Certified Audubon Bird Specialist
	Latonya Williams	-	Forest Supervisor (FU/MOE&H)
	Terrence Rodgers	-	Forest Assistant I (FU/MOE&H)
	Cliff Bethel	-	Forest Assistant III (FU/MOE&H)

13.0 References

1. Allan, T. G., 1986. *Management Plan for the Pine Forest of the Bahamas.*
2. Sikken, A., 2014. *Pine Forest Management Plan in the Bahamas Handbook:* FAO, Rome, Italy
3. Zobrist, et. al., 2012. *Basic Forest Inventory Techniques for Family Forest Owners.* A Pacific Northwest Extension Publication. University of Washington, Oregon State University and University of Idaho.
4. BEST Commission, 2013. *National Invasive Species Strategy for the Bahamas*
5. Government of the Bahamas, 1998. *National Forest Policy for the Bahamas*
6. Government of the Bahamas, 1959. *Wild Birds Protection Act*
7. Government of the Bahamas, 2010. *Forestry Act.*
8. Government of the Bahamas, 2014. *Forestry Regulations*
9. Government of the Bahamas, 2021. *Forestry (Declaration of Protected Trees) Order.*
10. Government of the Bahamas, 1972. *Housing Act and Regulations*
11. Government of the Bahamas, 2010. *Planning and Subdivision Act*
12. Government of the Bahamas, 2014. *Bahamas Public Park and Public Beaches Authority Act*
13. Department of Statistics, Government of the Bahamas, 2010. *Census Report*
14. Areces, et. al., 1999. *A Guide to Caribbean Vegetation Types: Preliminary Classification Systems and Descriptions*. The Nature Conservancy, Arlington VA. USA.
15. IUCN, 2012. *IUCN Red List Categories and criteria: version 3.1.* Second Edition, IUCN Species Survival Commission, Gland, Switzerland.
16. Gillison, A. N., 2006. *A Field Manual for Rapid Vegetation Classification and Survey for general purposes.* Center for International Forestry Research, Jakarta, Indonesia.
17. Hallett, Bruce 2006. *BIRDS of the Bahamas and the Turks and Caicos Islands.* Macmillan Caribbean.
18. Correll, D. S. and H. B., 1982. *Flora of the Bahama Archipelago*. A. R. Ganter Verlag KG, FL, USA.
19. Sibley, David Allen. 2003. *The SIBLEY Field Guide to Birds of Eastern North America*. Alfred A. Knopf, Inc. New York, USA.
20. Sealy, Neil. 2006. *Bahamian Landscapes.* 3rd Edition. Macmillan Caribbean.
21. White, Anthony W. A.1998. *Birders Guide to the Bahama Islands (including Turks and Caicos).* American Birding Association, Inc. Colorado, USA.
22. Little, et. al., 1977. *Land Resources of the Bahamas: a summary.* Land Resources Division, Ministry of Overseas Development, Tolworth Tower, Surrey, England.
23. IFC 2007. *Environmental, Health and Safety (EHS) Guidelines, Noise Management*.
24. US Army Corps of Engineers, 2004. *Water Resources Assessment of the Bahamas.*
25. World Health Organization, 2018. *Ambient (Outdoor) Air Quality and Health Fact Sheet No 313.*

14.0 Appendices

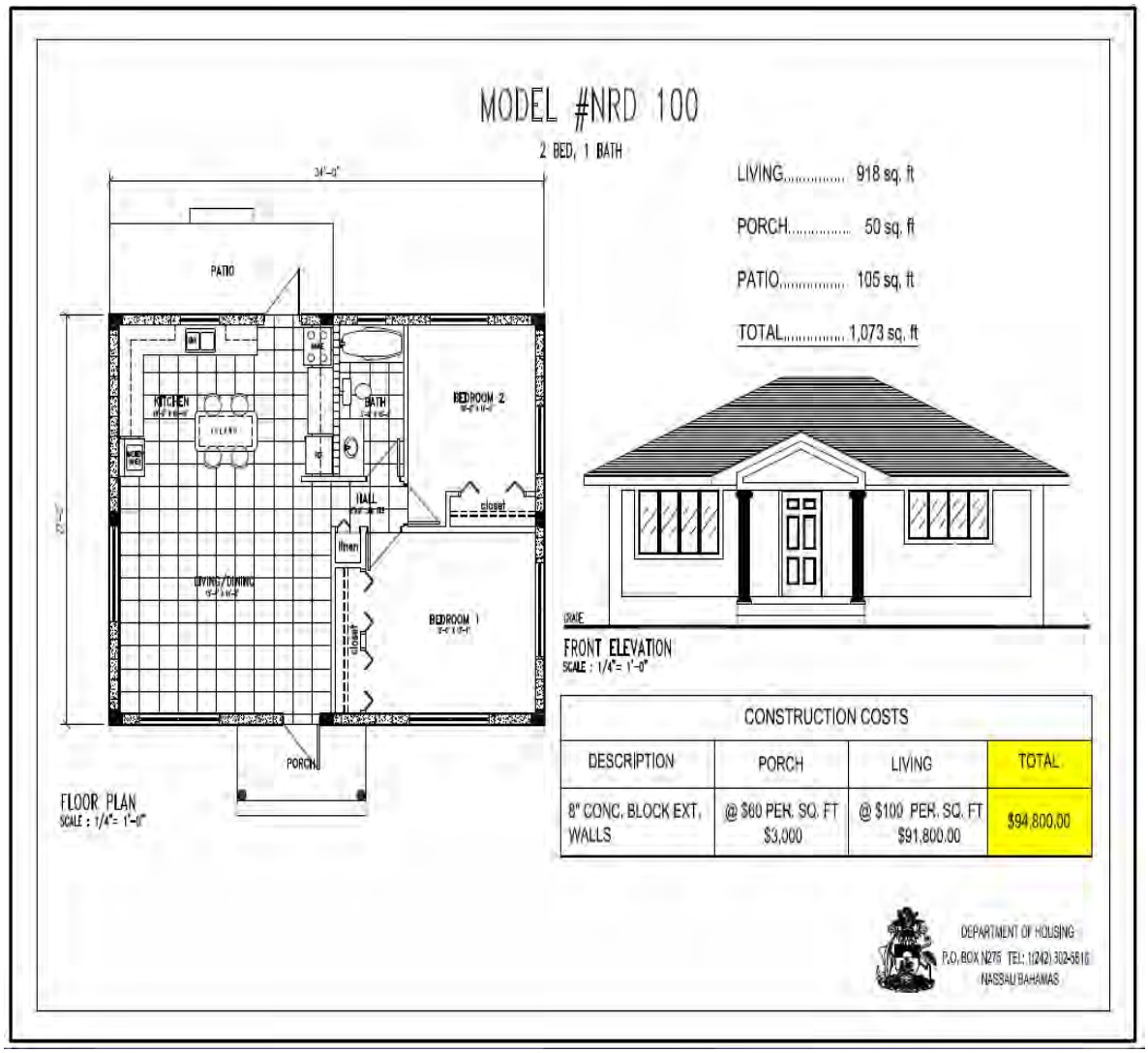
1. Appendix – A: Three Google images of New Providence Island, at different resolutions, situated at Carmichael Village Subdivision.
2. Appendix – B: The four model home types, Carmichael Village Subdivision
3. Appendix – C: Recorded Survey Plan NP 6049 of the Carmichael Village Subdivision
4. Appendix – D: Images of Random Sample Plot Methodology
5. Appendix – E: Images of illegal harvesting of pine trees and charred remains of pine stump
6. Appendix – F: Images of plant species diversity on Site
7. Appendix – G: Images showing illegal land clearance and quarry mining on Site
8. Appendix – H: Crown Grant showing 60 acres from the Minister Responsible for the disposition of Crown Land to the Minister Responsible for Housing.
9. Appendix – I: Avian Survey Report. Prepared by Ms. Predensa Moore – Audobon Certified Bird Specialist
10. Appendix – J: Sample plot data collection sheets.

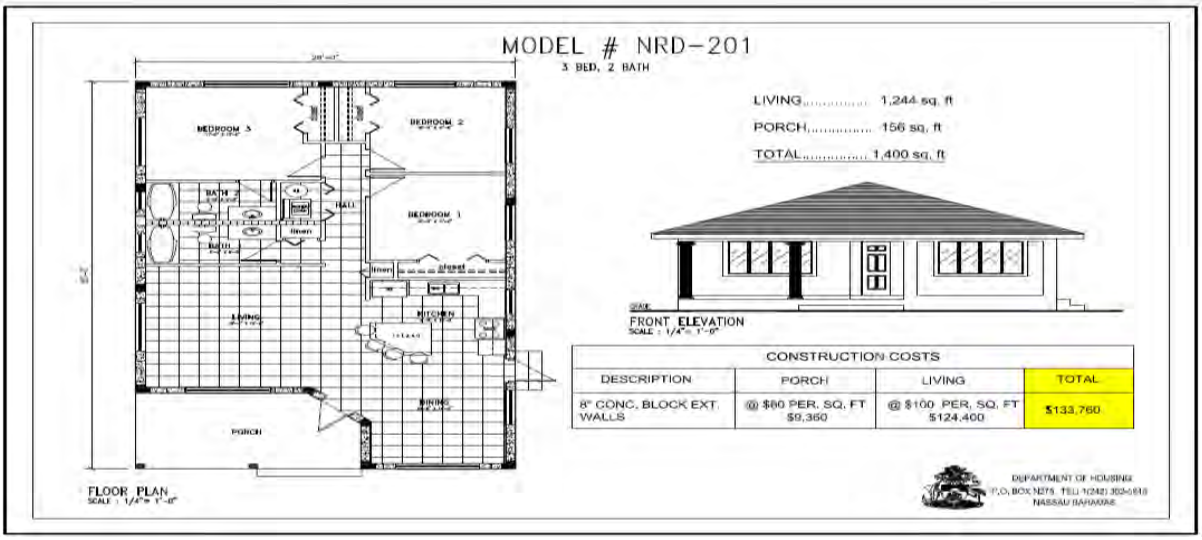
1. Appendix – A: *Showing three Google images of New Providence Island, and closer resolutions of the Carmichael Village Subdivision and its environs (Source: Google Earth, 2021).*

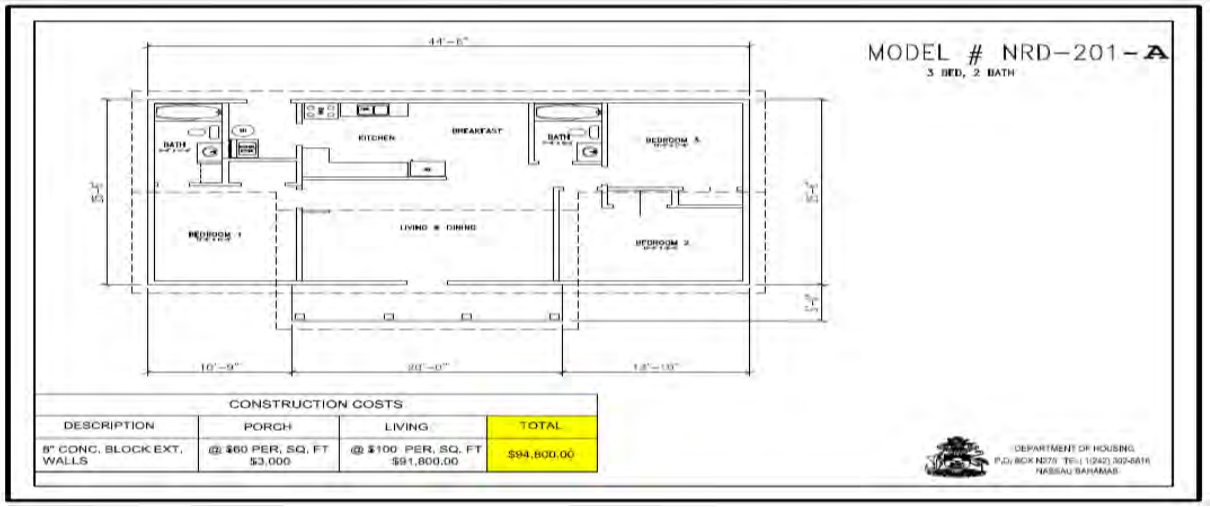

New Providence
Map depicting the Carmichael Village Subdivision Boundary
Legend
Carmichael Village Subdivision Boundary
Conservation Forest Boundary (Proposed)
Forest Reserve Boundary (Proposed)
Pine Trail Road West
Rocky Pine Rd
Carstone Rd
Halls Close
Carrols Cove
Carmichael Rd
Google Earth
Image © 2021 Maxar Technologies
©2021 Google
Image © 2021 CNES / Airbus
1 km
N

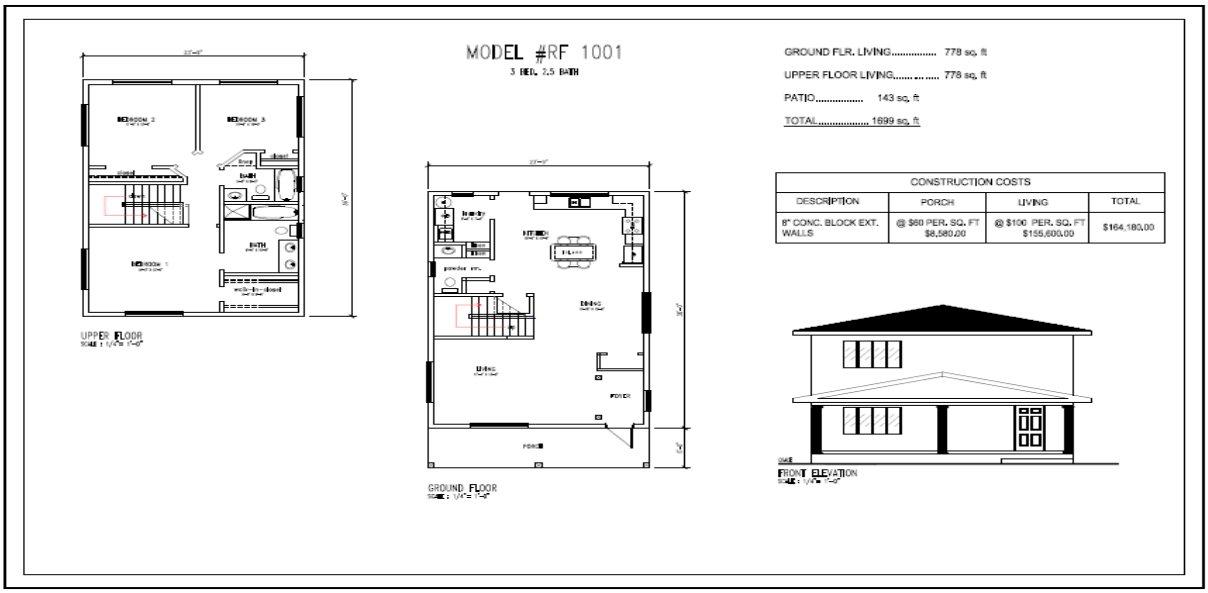

New Providence
Map depicting the Carmichael Village Subdivision Boundary
Legend
Carmichael Village Subdivision Boundary
Conservation Forest Boundary (Proposed)
Forest Reserve Boundary (Proposed)
Carstone Lane
Carmichael Rd
Google Earth
Image © 2021 Maxar Technologies
©2021 Google
Image © 2021 CNES / Airbus
300 m
N

2. Appendix – B: *shows the four home model types being proposed for construction on the 75 lots (Phase – 1) of the Carmichael Village Subdivision (Source: Department of Housing, 2021).*

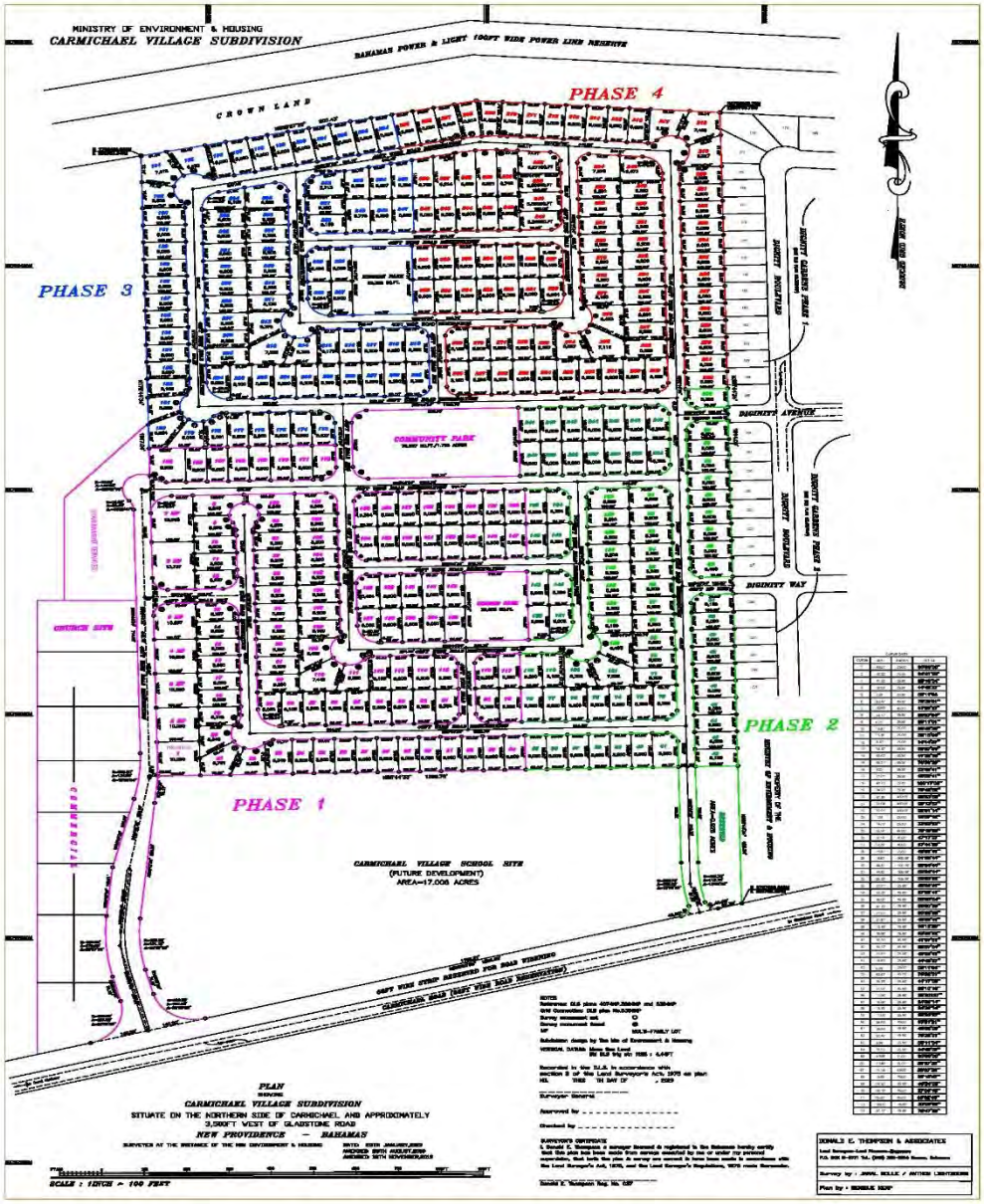



MODEL # NRD-201
3 BED, 2 BATH
LIVING..... 1,244 sq. ft
PORCH..... 156 sq. ft
TOTAL..... 1,400 sq. ft
FRONT ELEVATION
SCALE : 1/4"= 1'-0"
FLOOR PLAN
SCALE : 1/4"= 1'-0"
CONSTRUCTION COSTS
DESCRIPTION | PORCH | LIVING | TOTAL
8" CONC. BLOCK EXT. WALLS | @ $60 PER. SQ. FT $9,360 | @ $100 PER. SQ. FT $124,400 | $133,760
DEPARTMENT OF HOUSING
P.O. BOX N975 TEL: 1(242) 302-6810
NASSAU BAHAMAS


MODEL # NRD-201-A
3 BED, 2 BATH
CONSTRUCTION COSTS
DESCRIPTION | PORCH | LIVING | TOTAL
8" CONC. BLOCK EXT. WALLS | @ $60 PER. SQ. FT $3,000 | @ $100 PER. SQ. FT $91,800.00 | $94,800.00
DEPARTMENT OF HOUSING
P.O. BOX N975 TEL: 1(242) 302-6810
NASSAU BAHAMAS


MODEL #RF 1001
3 BED, 2.5 BATH
GROUND FLR. LIVING..... 778 sq. ft
UPPER FLOOR LIVING..... 778 sq. ft
PATIO..... 143 sq. ft
TOTAL..... 1699 sq. ft
CONSTRUCTION COSTS
DESCRIPTION | PORCH | LIVING | TOTAL
8" CONC. BLOCK EXT. WALLS | @ $60 PER. SQ. FT $8,580.00 | @ $100 PER. SQ. FT $155,600.00 | $164,180.00
UPPER FLOOR
GROUND FLOOR
FRONT ELEVATION

3. Appendix – C: *Showing the Recorded Survey Plan No. 6049, Carmichael Village Subdivision, comprising four – 4 phases (358 lots total). (Source: Department of Housing, 2021).*



4. Appendix – D*: Showing two pictures of a random sample plot methodology and data collection (Tally count of species abundance and diversity) (Source: Forestry Unit, 2021).*

5.Appendix – E: *showing old pine stumps, evidence of illegal harvesting of the species, in addition to the charred remains of a pine tree, evidence of a past forest fire a few years ago (Source: Forestry Unit, 2021).*

6. Appendix – F: *showing two images of plant species diversity in sample plot radius. Note the over-story pine trees, and dense silver thatch palms in the under-storey, (Source: Forestry Unit, 2021).*

7. Appendix – G*: Showing two pictures of the illegal clearance of forest vegetation, removal of topsoil, fill and quarry. Note continuous excavation below the normal ground surface level creating the permanent settlement of water, which is indicative of the underground freshwater lens in the area. (Source: Forestry Unit, 2021).*

8. Appendix – H: *Crown Grant document for 60 acres of Crown Land vested from the Minister Responsible for the disposition of Crown Lands to the Minister Responsible for Housing.*

RECORDED IN THE DEPARTMENT OF LANDS AND SURVEYS

GRANT BOOK LETTERED A9 FOLIO 55

THE COMMONWEALTH OF THE BAHAMAS

ELIZABETH THE SECOND

By the Grace of God, Queen of the Commonwealth of The Bahamas and of Her Other Realms and Territories, Head of the Commonwealth

To all to whom these presents shall come,

In consideration of the sum of ONE DOLLAR ($1.00) ----------

paid to us by MINISTER RESPONSIBLE FOR HOUSING a corporation sole under the laws of the Bahamas and having its registered office in the city of Nassau in the Island of New Providence in the Commonwealth of The Bahamas ----------

(hereinafter called "The purchaser") at or before the making of these presents (the receipt whereof is hereby acknowledged) and in further consideration of the payment to Us Our Heirs and Successors of a yearly rent of one peppercorn if the same shall be lawfully demanded We HEREBY GRANT unto the purchaser ALL THAT certain lot piece or parcel of land hereinafter described in the Schedule hereto which said land hereby granted or intended so to be has the shape and dimensions set forth and delineated in the diagram drawn hereunder EXCEPTING however out of this Grant unto Us Our Heirs Successors and Assigns all silver gold precious metal coal and mineral oil underlying the said land AND RESERVING the right at all times hereafter to enter the said land hereinbefore granted and to remain thereon as long as is necessary to search for win and remove all such silver gold precious metal coal and mineral oil TO HAVE AND TO HOLD the same UNTO AND TO THE USE of the purchaser in fee simple.

SCHEDULE:

ALL THAT certain lot piece or parcel of land containing by admeasurement SIXTY ACRES or thereabouts being the Parcel on a plan on record in the Department of Lands and Surveys as Plan 5037 of New Providence situate west of Gladstone Road, approximately 450 feet north of Carmichael Road and immediately west of Dignity Gardens Subdivision Phases One and Two in the Island of New Providence in the Commonwealth of The Bahamas ABUTTING AND BOUNDING towards the NORTH on a Buffer Strip being Crown Land towards the EAST on Dignity Gardens Subdivision Phases One and Two towards the SOUTH and WEST on Crown Lands or however else the same may abut and bound which said lot piece or parcel of land is more particularly delineated and shown colored pink on the diagram below ----------

Department of Environmental DEC 18 2020 Planning & Protection

IN WITNESS WHEREOF the Minister responsible for Crown Lands has hereto affixed his seal this 8th day of January, 2009.

Department of Environmental REGISTRY DEC 18 2020 Planning & Protection

The official seal of the Minister responsible for Crown Lands was hereto affixed by The Rt. Honourable Hubert A. Ingraham,

and the said Minister subscribed his signature thereto.

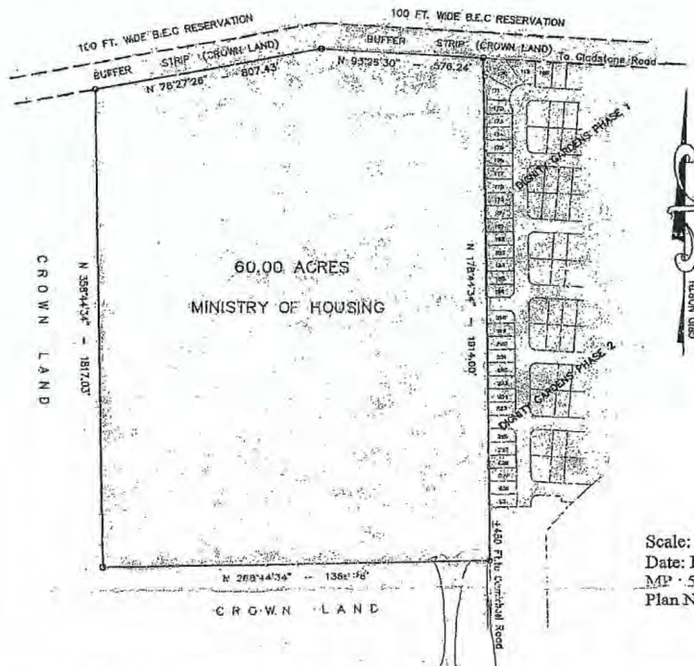
Hubert A. Ingraham

Minister responsible for Lands and Surveys

THE DIAGRAM

hereinbefore mentioned of a lot piece or parcel of land being the Parcel situate west of Gladstone Road, approximately 450 feet north of Carmichael road and immediately west of Dignity Gardens Subdivision Phases One and Two in the Island of New Providence in the Commonwealth of The Bahamas

AREA = 60.00 ACRES



Scale: 1inch = 400 feet
Date: December 22, 2008
MP - 5173
Plan No. 5037 New Providence

ACTING SURVEYOR GENER.

The above diagram is an extract from a plan on record in the Department of Lands and Surveys as Plan numbered 5037 of New Providence

The portion coloured pink represents the area granted

UNTO

MINISTER RESPONSIBLE FOR HOUSING

The Queen

TO

MINISTER RESPONSIBLE FOR HOUSING

GRANT

Lodged for Record by Department of Lands & Surveys

this 30th *day of* Jan

A.D. 2009

Registrar General.

The Commonwealth Of The Bahamas

REGISTRAR GENERAL'S OFFICE

Recorded in Book 10678 *Page* 487 to 488

this 30th *day of* January 2009

Registrar General

Locality: Situate west of Gladstone Road, approximately 450 feet north of Carmichael Road and immediately west of Dignity Gardens Subdivision Phases One and Two in the Island of New Providence in the Commonwealth of The Bahamas

Consideration ONE DOLLAR ($1.00)

Department of Environmental Planning & Protection DEC 18 2020

Department of Environmental REGISTRY DEC 18 2020 Planning & Protection

Avian Survey Report

Carmichael Village Subdivision

New Providence, The Bahamas

Prepared by: Pre Prepared by: Predensa Moore

For: Department of Environmental

Planning and Protection (DEPP)

Date: 29 April 2021

2.0 AVIAN SURVEY

An avian survey was conducted on 29 April, 2021 to identify the presence, abundance and habitat utilization of avian species within the boundaries of the site.

2.1 Methodology

The avian assessment comprised of two (2) hours of active avian and ecological observations. Species numbers were recorded in the abundance categories, Single, Few (2-10) and Many (11-100). Species recorded were compiled for final abundance estimates. Status is based on International Union for Conservation of Nature (IUCN).

2.2 Results

2.2.1 Species Observed

2.2.1.1 Species diversity

A total of nine (9) species were recorded during the survey (See Table 2).

Table 2: Avifauna observed during survey of the Carmichael Village Subdivision site, New Providence, The Bahamas.

TABLE KEY:	
RANGE	**STATUS**
PRB = Permanent Resident Breeding	**LC** = Least Concern (Conservation - IUCN)
WRN = Winter Resident Non-Breeding	**NT** = Near Threatened (Conservation – IUCN)
SRB = Summer Resident Breeding	**E** = Endemic
	I = Introduced

SCIENTIFIC NAME	**COMMON NAME**	**STATUS/RANGE/ CONSERVATION STATUS**	**MASTER OBSERVATION**
Streptopelia decaocto	Eurasian Collared Dove	PRB/LC/**I**	F

Patagioenas leucocephala	White-crowned Pigeon	PRB/**NT**	F
Zenaida macroura	Mourning Dove	PRB/LC	F
Columbina passerina	Common Ground Dove	PRB/LC	F
Nesophlox evelynae	Bahama Woodstar Hummingbird	PRB/LC/**E**	S
Charadrius vociferus	Killdeer	PRB/LC	F
Falco columbarius	Merlin	WRN/LC	S
Tyrannus dominicensis	Gray Kingbird	SRB/LC	F
Mimus polyglottos	Northern Mockingbird	PRB/LC	F

2.2.1.2 Range

The range of a species is the geographic areas where the birds can be consistently found e.g. migrant birds have seasonal ranges while restricted range species remain on same island or in same region year-round.

2.2.1.2.1 Permanent Resident Breeding

Permanent Resident breeding species refers to the resident species that live and breed year-round throughout the Bahama Islands.

2.2.1.2.2 Winter Resident Non-Breeding

Winter Resident Non-breeding species refers to the annual non-breeding fall/winter (generally October to April) migrants to the Bahama Islands from North America.

2.2.1.2.3 Summer Resident Breeding

Summer Resident breeding refers to migrants that breed in The Bahamas during summer from April to October and spend the rest of the year in other regions.

2.2.1.2.4 Endemic Species

Endemic species are birds that exist only in The Bahamas.

Bahama Woodstar Hummingbird *Nesophlox evelynae* was recorded at the site.

2.2.1.3 Conservation Status

2.2.1.3.1 Protected Species

All of the species observed are protected under the Wild Birds Protection Act (Statute Law of The Bahamas, Chapter 249).

2.2.1.3.2 Species of Concern

"*Near Threatened*" (NT) by the IUCN classifies a species that may be considered *threatened* with extinction in the *near* future, although it does not currently qualify for the *threatened* status.

White-crowned Pigeon *Patagioenas leucocephala,* designated a N*ear-threatened status by ICUN was recorded during the investigations.*

2.2.1.3.3 Endangered Species

None of the species recorded are classed as endangered.

2.2.2 Habitat Utilization

The site surveyed consisted of scrubland vegetation with pineland and human disturbed habitats. The majority of the bird activity was recorded along the edges of the trails and on the overhead utility lines. The previously cleared/disturbed areas were overgrown but lacked mature fruiting plants.

The lack of species numbers observed can be attributed to several reasons:

1. Lack of food sources due to human disturbed habitat
2. Seasonal drought inhibiting the vegetation from blooming – immature fruit/berries observed
3. Disturbance caused by workers/machines in the area
4. Most of the non-breeding migrants have returned to North America to breed

The combination of common resident bird species along with a few species of 'regular fall/winter non-breeding migrants and a summer breeding migrant' recorded on the site confirmed they have adapted to the habitat and utilize all of the resources.

4.0 References

2006. Hallett, Bruce. BIRDS of The Bahamas and the Turks & Caicos Islands. Macmillan Caribbean.

2003. Sibley, David Allen. The SIBLEY Field Guide to Birds of Eastern North America. Alfred A. Knopf, Inc. New York, USA.

1998. White, Anthony W. A Birders Guide to the Bahama Islands (including Turks and Caicos). American Birding Association, Inc. Colorado, USA.

ENVIRONMENTAL BASELINE DATA COLLECTION SHEET

COLLECTION DATA

Plot ID:	NPC 4		
Pre-field Coordinates:	X: 256500	Y: 2768436	
GPS Coordinates:	X: 256504	Y: 2768435	
Coordinate Method :	Google Maps/Earth (GPS) Maps Website		
Date: Feb 8th 2021	Time start: 10:44	Time finished: 11:51	Oraganization: Forestry / Housing
Team Leader: Terrence Rodgers	Other:		
Team Members: Cliff Bethel & Andrea Curry			

LOCATION DATA

Country: The Bahamas	Settlement: Carmichael	Island: New Providence

Plot Description: Plot area was disturb by fire and was recently Cleared. Understory is dominated by Silver thatch (Coccothrinax argentea) and bed grass (Andropogon glomeratus).

General Observation: The Plot area is surrounded by an going development and Clearned roads. To the east is a large mound of dirt 1meter from the Plot

HABITAT DATA

Total Size of Area:	60 Acres	Plot Radius	15meters (49feet)
Forest Type:	Pine forest	Sub-Type:	Dry-Pine forest
Stand Size Class:		Land Cover Class:	Treeland Shurbland Grassland
Geology:			
Topography:			
Soil Type:	Clay (Loam) Silt Sand	Other:	
Surface or Ground Water:	(YES) / NO	Other:	
Land Use:	Housing developement		

FLORA

Tree Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Acacia choriophylla (Cinnecord)	–	2	3	9	14	–	–
Pinus caribaea var. bahamensis (Caribbean Pine)	–	–	–	6	6	P	Vulnerable
Manilkara zapota (Sapodilla)							
Bursera simaruba (gum elemi)							
Casuarina equisetifolia (Australian pine)							
Casuarina glauca (Australian pine)							
Canella winterana (Wild cinnamon)							
Coccoloba diversifolia (Pigeon plum)							
Coccothrinax argentea (Silver thatch)	115	35	41	12	203	P	–
Guapira discolor (Small Leaved Blolly)							
Leucaena leucocephala (Jimbey)							
Lysiloma bahamensis (Wild Tamarind)							
Juniperus barbadensis (Red Cedar)							
Guapira obtusata (Broad Leaf Blolly)	–	–	3	6	9	–	least Concern
Piscidia piscipula (Dog wood)							
Metopium toxiferum (Poison wood)	56	50	10	17	133	I	least Concern
Thrinax microcarpa (Thatch Palm)							
Sabal palmetto (Pond top)							
Schinus terebinthifolius (Brazilian pepper)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pithecellobium keyense (Ram's Horn)	–	–	7	18	25	–	–
Trema lamarckiana (pain-in-back)	2	1	3	–	5	–	least Concern
Erithalis fruticosa (Black Torch)							
Cordia bahamensis (Rough varronia)	4	–	3	7	14	–	least Concern
Caesalpinia vesicaria (Brasilletto)	–	–	8	5	13	P	–
Byrsonima lucida (Guanaberry)	–	–	7	–	7	–	–
Bourreria ovata (Bahama Strongback)							
Tabebuia bahamensis (Five finger)	2	–	4	9	15	E	least Concern
Zamia integrifolia (longer Coontie, Bay Rush)							
Zamia pumila (coontie)							
Palicourea pubescens (Hairy Wild Coffee)							
Ipomoea indica (morning glory)							
Pithecellobium keyense (Rams Horn)							
Chiococca alba (Snow Berry)							
Melaleuca quinquenervia (Paper bark)							
Veronia bahamensis (cat tongue)							
Zanthoxylum fagara (wild lime)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Phialanthus myrtilioides (Candlewood)							
Agave bahamana (Bahama Century)							
Phyllanthus amarus (Gale-O-Wind)							
Scaevola taccada (Hawaiian seagrape)							
Tetrazygia bicolor (wild guava)	7	–	25	6		–	least concern
Myrcianthes fragrans (Bahamia stopper)							
Blepharocalyx salicifolius (stalked stopper)							
Petitia domingensis (Bastard Stopper)							
Phsycotria nervosa (Wild coffee)	6	–	–	41		–	least Concern
Mosiera longipe (Sweet Margaret)							
Lantana x bahamensis (Wild Sage)	–	–	3	7		E	–
Turnera ulmifolia (Buttercups)							

Vine & Grasses Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Anemia adiantifolia (Maidenhair)	–	10%	10%	5%	6%	–	–
Ernodea littoralis (Golden Creeper)	27%	50%	25%	15%	29%	–	least Concern
Rhynchospora floridensis (White-top Sage)	–	6%	2%	1%	3%	–	–
Bidens alba (Shepherds Needle)							
Andropogon glomeratus (Bed Grass)	–	80%	90%	95%	88%	–	–
Toxicodendron radicans (Poison Ivy)							
Cassytha filiformis (Love Vine)	–	10%	30%	10%	13%	–	–
Eragrostis ciliaris (Fringed Love Grass)							
Eragrostis bahamensis (Bahama Love Grass)							
Mucuna pruriens (Monkey tamarind)							
Smilax havanensis (Chaney Briar)	2%	4%	5%	2%	3%	–	–

OTHER SPECIES

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pe. lunna Plumula (Comb fan)	–	2%	5%	–	4%	–	–

ENVIRONMENTAL BASELINE DATA COLLECTION SHEET

COLLECTION DATA

Plot ID:	NPC 8		
Pre-field Coordinates:	X: 256464	Y: 2768631	
GPS Coordinates:	X: 256457	Y: 2768628	
Coordinate Method :	Google Maps/Earth (GPS) Maps Website		
Date: Feb 9th 2021	Time start: 10:47	Time finished: 11:58	Oraganization: Forestry / Housing
Team Leader: Terrence Rodgers	Other:		
Team Members: Cliff Bethel & Andrew Curry			

LOCATION DATA

Country: The Bahamas	Settlement: Carmichael	Island: New Providence

Plot Description: Pine forest with a understory moderately high. Pine tree in plot are Juvenile. Thatch Palms (Coccothrinax argentea) and Poison wood (metopium toxiferum) are the most dominant species. A Juvenile Pine tree was used as the Plot Center. There are burnt Pine stumps that might indicate there was a forest fire in the past. A forest Road cut through Quadrant 3 and Quadrant 4.

General Observation: The Plot is surrounded by forest roads on a three sides. Pine trees that are surrounding the plot are Juvenile and Spread apart. forest area have been disturb in the past indicated by the severval Pine trees cut down in the area.

HABITAT DATA

Total Size of Area:	60 Acres	Plot Radius	15 meters (49 feet)
Forest Type:	Pine forest	Sub-Type:	Dry - Pine forest
Stand Size Class:	—	Land Cover Class: (Treeland) Shurbland Grassland	
Geology:			
Topography:			
Soil Type:	Clay (Loam) Silt Sand	Other:	
Surface or Ground Water:	(YES) / NO	Other:	
Land Use:	Housing Development		

FLORA

Tree Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Acacia choriophylla (Cinnecord)	5	8	11	7	31	—	—
Pinus caribaea var. bahamensis (Caribbean Pine)	7	10	8	5	30	P	Vulnerable
Manilkara zapota (Sapodilla)							
Bursera simaruba (gum elemi)							
Casuarina equisetifolia (Australian pine)							
Casuarina glauca (Australian pine)							
Canella winterana (Wild cinnamon)							
Coccoloba diversifolia (Pigeon plum)							
Coccothrinax argentea (Silver thatch)	18	22	20	17	77	P	—
Guapira discolor (Small Leaved Blolly)							
Leucaena leucocephala (Jimbey)							
Lysiloma bahamensis (Wild Tamarind)							
Juniperus barbadensis (Red Cedar)							
Guapira obtusata (Broad Leaf Blolly)	10	—	—	—	10	—	least Concern
Piscidia piscipula (Dog wood)							
Metopium toxiferum (Poison wood)	54	44	42	41	181	I	least Concern
Thrinax microcarpa (Thatch Palm)							
Sabal palmetto (Pond top)							
Schinus terebinthifolius (Brazilian pepper)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pithecellobium keyense (Ram's Horn)	9	17	8	12	46	—	—
Trema lamarckiana (pain-in-back)							
Erithalis fruticosa (Black Torch)							
Cordia bahamensis (Rough varronia)	6	18	—	3	27	—	least Concern
Caesalpinia vesicaria (Brasilletto)	2	—	1	3	6	P	—
Byrsonima lucida (Guanaberry)	—	3	1	—	4	—	—
Bourreria ovata (Bahama Strongback)							
Tabebuia bahamensis (Five finger)	5	8	12	4	29	E	least Concern
Zamia integrifolia (longer Coontie, Bay Rush)	—	2	5	—	7	P	Near threatened
Zamia pumila (coontie)							
Palicourea pubescens (Hairy Wild Coffee)							
Ipomoea indica (morning glory)							
Pithecellobium keyense (Rams Horn)							
Chiococca alba (Snow Berry)	7	6	12	4	29	—	—
Melaleuca quinquenervia (Paper bark)							
Veronia bahamensis (cat tongue)							
Zanthoxylum fagara (wild lime)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Phialanthus myrtilloides (Candlewood)							
Agave bahamana (Bahama Century)							
Phyllanthus amarus (Gale-O-Wind)							
Scaevola taccada (Hawaiian seagrape)							
Tetrazygia bicolor (wild guava)	6	–	8	7	21	–	least Concern
Myrcianthes fragrans (Bahamia stopper)							
Blepharocalyx salicifolius (stalked stopper)							
Petitia domingensis (Bastard Stopper)							
Phsycotria nervosa (Wild coffee)	4	12	3	3	22	–	least Concern
Mosiera longipe (Sweet Margaret)							
Lantana x bahamensis (Wild Sage)	–	2	1	4	7	E	–
Turnera ulmifolia (Buttercups)							

Vine & Grasses Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Anemia adiantifolia (Maidenhair)	10%	15%	8%	10%	11%	–	–
Ernodea littoralis (Golden Creeper)	5%	2%	1%	1%	2%	–	least Concern
Rhynchospora floridensis (White-top Sage)	1%	2%	1%	1%	1%	–	–
Bidens alba (Shepherds Needle)							
Andropogon glomeratus (Bed Grass)	90%	95%	80%	80%	86%	–	–
Toxicodendron radicans (Poison Ivy)							
Cassytha filiformis (Love Vine)							
Eragrostis ciliaris (Fringed Love Grass)							
Eragrostis bahamensis (Bahama Love Grass)							
Mucuna pruriens (Monkey tamarind)							
Smilax havanensis (Chaney Briar)	5%	2%	5%	2%	4%	–	–

OTHER SPECIES

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Bletia Purpurea	1	5	–	–	6	–	endangered
Pteridium aquilium (Bracken fern)	–	–	4%	3%	4%	–	–
Coccoloba Uvifera	–	–	–	1		–	–

ENVIRONMENTAL BASELINE DATA COLLECTION SHEET

COLLECTION DATA

Plot ID:	NPC 10		
Pre-field Coordinates:	X: 256562	Y: 2768579	
GPS Coordinates:	X: 256562	Y: 2768575	
Coordinate Method :	Google Maps/Earth (GPS) Maps Website		
Date: Feb 11th 2021	Time start: 9:44	Time finished: 10:46	Oraganization: Forestry / Housing
Team Leader: Terrence Rodgers	Other:		
Team Members: Cliff Bethel & Andrew Curry			

LOCATION DATA

Country: The Bahamas	Settlement: Carmichael	Island: New Providence

Plot Description: Area is dominated with Silver thatch (Coccothrinax argentea) and Poison wood (Metopium toxiferum). Understory is estimated to be 1 meter in height. A Silver thatch was used as the plot center and is estimated to be the largest tree in the area at 3 meter. In Quadrant 2 there was a hill 3 meters in elevation.

General Observation: Area was disturbed by forest fire that was estimated to happened 5 years ago. Scorched heigth was 5feet 2 inches. forest Road is Surrounding the area and is estimated to be 30 - 40 meters.

HABITAT DATA

Total Size of Area:	60 Acres	Plot Radius	15 meters (49 feet)
Forest Type:	Pine forest	Sub-Type:	Dry - Pine
Stand Size Class:	—	Land Cover Class: (Treeland) Shurbland Grassland	
Geology:			
Topography:			
Soil Type:	Clay (Loam) Silt Sand	Other:	
Surface or Ground Water:	(YES) / NO	Other:	
Land Use:	Housing development		

FLORA

Tree Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Acacia choriophylla (Cinnecord)	2	4	3	6	15	—	—
Pinus caribaea var. bahamensis (Caribbean Pine)	—	3	2	6	11	P	Vulnerable
Manilkara zapota (Sapodilla)							
Bursera simaruba (gum elemi)							
Casuarina equisetifolia (Australian pine)							
Casuarina glauca (Australian pine)							
Canella winterana (Wild cinnamon)							
Coccoloba diversifolia (Pigeon plum)							
Coccothrinax argentea (Silver thatch)	21	24	37	30	112	P	—
Guapira discolor (Small Leaved Blolly)	3	1	3	2	9	—	least Concern
Leucaena leucocephala (Jimbey)							
Lysiloma bahamensis (Wild Tamarind)							
Juniperus barbadensis (Red Cedar)							
Guapira obtusata (Broad Leaf Blolly)							
Piscidia piscipula (Dog wood)							
Metopium toxiferum (Poison wood)	20	41	36	50	147	I	least Concern
Thrinax microcarpa (Thatch Palm)							
Sabal palmetto (Pond top)							
Schinus terebinthifolius (Brazilian pepper)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pithecellobium keyense (Ram's Horn)	4	7	5	20	36	—	—
Trema lamarckiana (pain-in-back)	4	4	—	—	8	—	least Concern
Erithalis fruticosa (Black Torch)							
Cordia bahamensis (Rough varronia)	7	21	10	3	41	—	least Concern
Caesalpinia vesicaria (Brasilletto)	2	3	5	34	44	P	—
Byrsonima lucida (Guanaberry)	3	5	1	1	10	—	—
Bourreria ovata (Bahama Strongback)							
Tabebuia bahamensis (Five finger)	4	12	6	—	22	E	least concern
Zamia integrifolia (longer Coontie, Bay Rush)							
Zamia pumila (coontie)							
Palicourea pubescens (Hairy Wild Coffee)							
Ipomoea indica (morning glory)							
Pithecellobium keyense (Rams Horn)							
Chiococca alba (Snow Berry)							
Melaleuca quinquenervia (Paper bark)							
Veronia bahamensis (cat tongue)							
Zanthoxylum fagara (wild lime)							

Shrub & Herbs Species							
Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Phialanthus myrtilloides (Candlewood)							
Agave bahamana (Bahama Century)							
Phyllanthus amarus (Gale-O-Wind)							
Scaevola taccada (Hawaiian seagrape)							
Tetrazygia bicolor (wild guava)	5	4	3	2	17	—	least Concern
Myrcianthes fragrans (Bahamia stopper)							
Blepharocalyx salicifolius (stalked stopper)							
Petitia domingensis (Bastard Stopper)							
Phsycotria nervosa (Wild coffee)							
Mosiera longipe (Sweet Margaret)							
Lantana x bahamensis (Wild Sage)	3	2	4	—	9	E	—
Turnera ulmifolia (Buttercups)							

Vine & Grasses Species							
Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Anemia adiantifolia (Maidenhair)	2%	3%	3%	5%	3%	—	—
Ernodea littoralis (Golden Creeper)	1%	1%	1%	1%	1%	—	least concern
Rhynchospora floridensis (White-top Sage)	4%	5%	2%	2%	3%	—	—
Bidens alba (Shepherds Needle)							
Andropogon glomeratus (Bed Grass)	76%	76%	75%	74%	75%	—	—
Toxicodendron radicans (Poison Ivy)							
Cassytha filiformis (Love Vine)	5%	5%	10%	5%	5%	—	—
Eragrostis ciliaris (Fringed Love Grass)							
Eragrostis bahamensis (Bahama Love Grass)							
Mucuna pruriens (Monkey tamarind)							
Smilax havanensis (Chaney Briar)	1%	3%	2%	5%	3%	—	—

OTHER SPECIES							
Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Peluma Plumula (Comb fern)	2%	2%	5%	5%	4%	—	—
Stachytarpheta Jamaicensis (Rat tail)	-	-	-	5	5	—	—
Chiococca alba (Snow Berry)	2%	2%	1%	1%	1%	—	—

ENVIRONMENTAL BASELINE DATA COLLECTION SHEET

COLLECTION DATA

Plot ID:	NPC 14		
Pre-field Coordinates:	X: 256651	Y: 2768438	
GPS Coordinates:	X: 256651	Y: 2768437	
Coordinate Method :	Google Maps/Earth (GPS) Maps Website		
Date:	Time start: 12:47	Time finished: 1:56	Oraganization: Forestry / Housing
Team Leader: Terrance Rodgers	Other:		
Team Members: Cliff Bethel & Andrew Curry			

LOCATION DATA

Country: The Bahamas | Settlement: Carmichael | Island: New Providence

Plot Description: Plot has very large Silver Thatch (Coccothrinax argentea) estimated to be 3-4 meters in hieght. Juvenile Pine trees were the second large species in the plot area. Understory about 1 meter and Poison wood (metopium toxiferum), Cinnecord (acacia choriophilla) and Ram's Horn (Pithecellobium keyense) are the most dominant species.

General Observation: The area is Surrounded by development and several forest Roads are close to the Plot. In Quadrant 3 northeast of the Plot there was a large Cluster of Juvenile Pine.

HABITAT DATA

Total Size of Area:	60 Acres	Plot Radius	15 meters (49 feet)
Forest Type:	Pine forest	Sub-Type:	Dry - Pine forest
Stand Size Class:	--	Land Cover Class: (Treeland) Shurbland Grassland	
Geology:			
Topography:			
Soil Type:	Clay (Loam) Silt Sand	Other:	
Surface or Ground Water:	(YES)/ NO	Other:	
Land Use:	Housing development		

FLORA

Tree Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Acacia choriophylla (Cinnecord)	10	4	14	12	4	—	—
Pinus caribaea var. bahamensis (Caribbean Pine)	3	5	-	-	8	P	Vulnerable
Manilkara zapota (Sapodilla)							
Bursera simaruba (gum elemi)							
Casuarina equisetifolia (Australian pine)							
Casuarina glauca (Australian pine)							
Canella winterana (Wild cinnamon)							
Coccoloba diversifolia (Pigeon plum)							
Coccothrinax argentea (Silver thatch)	17	25	30	23	95	P	—
Guapira discolor (Small Leaved Blolly)							
Leucaena leucocephala (Jimbey)							
Lysiloma bahamensis (Wild Tamarind)							
Juniperus barbadensis (Red Cedar)							
Guapira obtusata (Broad Leaf Blolly)	1	3	2	4	10	—	least Concern
Piscidia piscipula (Dog wood)							
Metopium toxiferum (Poison wood)	21	30	43	21	115	I	least Concern
Thrinax microcarpa (Thatch Palm)							
Sabal palmetto (Pond top)							
Schinus terebinthifolius (Brazilian pepper)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pithecellobium keyense (Ram's Horn)	12	6	20	18	56	—	—
Trema lamarckiana (pain-in-back)						—	least Concern
Erithalis fruticosa (Black Torch)							
Cordia bahamensis (Rough varronia)	6	4	5	3	18	—	least Concern
Caesalpinia vesicaria (Brasilletto)	2	-	-	-	2	P	—
Byrsonima lucida (Guanaberry)	—	-	8	3	11	—	—
Bourreria ovata (Bahama Strongback)							
Tabebuia bahamensis (Five finger)	3	2	5	2	12	E	least Concern
Zamia integrifolia (longer Coontie, Bay Rush)							
Zamia pumila (coontie)							
Palicourea pubescens (Hairy Wild Coffee)							
Ipomoea indica (morning glory)							
Pithecellobium keyense (Rams Horn)							
Chiococca alba (Snow Berry)							
Melaleuca quinquenervia (Paper bark)							
Veronia bahamensis (cat tongue)							
Zanthoxylum fagara (wild lime)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Phialanthus myrtilloides (Candlewood)							
Agave bahamana (Bahama Century)							
Phyllanthus amarus (Gale-O-Wind)							
Scaevola taccada (Hawaiian seagrape)							
Tetrazygia bicolor (wild guava)	2	4	-	3	9	—	least Concern
Myrcianthes fragrans (Bahamia stopper)							
Blepharocalyx salicifolius (stalked stopper)							
Petitia domingensis (Bastard Stopper)							
Phsycotria nervosa (Wild coffee)	4	3	7	4	18	—	least Concern
Mosiera longipe (Sweet Margaret)							
Lantana x bahamensis (Wild Sage)							
Turnera ulmifolia (Buttercups)							

Vine & Grasses Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Anemia adiantifolia (Maidenhair)	12%	15%	15%	10%	13%	—	—
Ernodea littoralis (Golden Creeper)	1%	2%	5%	1%	3%	—	least Concern
Rhynchospora floridensis (White-top Sage)	1%	1%	1%	1%	1%	—	—
Bidens alba (Shepherds Needle)							
Andropogon glomeratus (Bed Grass)	15%	20%	35%	20%	23%	—	—
Toxicodendron radicans (Poison Ivy)							
Cassytha filiformis (Love Vine)	2%	5%	1%	1%	2%	—	—
Eragrostis ciliaris (Fringed Love Grass)							
Eragrostis bahamensis (Bahama Love Grass)							
Mucuna pruriens (Monkey tamarind)							
Smilax havanensis (Chaney Briar)	1%	2%	1%	1%	1%	—	—

OTHER SPECIES

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pectuma Plumula (Comb fern)		2%			2%	—	—

ENVIRONMENTAL BASELINE DATA COLLECTION SHEET

COLLECTION DATA

Plot ID:	NPC 17		
Pre-field Coordinates:	X: 256736	Y: 2768641	
GPS Coordinates:	X: 256726	Y: 2768640	
Coordinate Method :	Google Maps/Earth (GPS) Maps Website		
Date: Feb 11th 2021	Time start: 10:55	Time finished: 12:00	Oraganization: Forestry / Housing
Team Leader: Terrence Rodgers	Other:		
Team Members: Cliff Bethel & Andrew Curry			

LOCATION DATA

Country: The Bahamas	Settlement: Carmicheal	Island: New Providence

Plot Description: A Juvenile Pine tree was used as the plot center. Understory is estimated to be 1meter. Dominat Speices are Silver Palms (Coccothrinax argentea), Poison wood (metopium toxiferum) and Piss-a-bed (Vallesia antillana). There is a cluster of Juvenile Pine tree estimated to be 2 meters.

General Observation: Area was disturbed by forest fire and several Pine tree were cut down. The fire was estimated to happened 5 years ago. To the east of the Plot there is a paved Road and a forest Road to the west

HABITAT DATA

Total Size of Area:	60 Acres	Plot Radius	15meter (49 feet)
Forest Type:	Pine forest	Sub-Type:	Dry - Pine forest
Stand Size Class:	—	Land Cover Class:	(Treeland) Shurbland Grassland
Geology:			
Topography:			
Soil Type:	Clay (Loam) Silt Sand	Other:	
Surface or Ground Water:	(YES) / NO	Other:	
Land Use:	Housing development		

FLORA

Tree Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Acacia choriophylla (Cinnecord)	5	7	–	3	15	–	–
Pinus caribaea var. bahamensis (Caribbean Pine)	7	15	8	7	36	P	Vulnerable
Manilkara zapota (Sapodilla)							
Bursera simaruba (gum elemi)							
Casuarina equisetifolia (Australian pine)							
Casuarina glauca (Australian pine)							
Canella winterana (Wild cinnamon)							
Coccoloba diversifolia (Pigeon plum)							
Coccothrinax argentea (Silver thatch)	22	30	31	10	93	P	–
Guapira discolor (Small Leaved Blolly)							
Leucaena leucocephala (Jimbey)							
Lysiloma bahamensis (Wild Tamarind)							
Juniperus barbadensis (Red Cedar)							
Guapira obtusata (Broad Leaf Blolly)	2	6	–	–	8	–	least Concern
Piscidia piscipula (Dog wood)							
Metopium toxiferum (Poison wood)	18	24	39	50	134	I	least Concern
Thrinax microcarpa (Thatch Palm)							
Sabal palmetto (Pond top)							
Schinus terebinthifolius (Brazilian pepper)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pithecellobium keyense (Ram's Horn)	6	9	50	30	95	–	–
Trema lamarckiana (pain-in-back)							
Erithalis fruticosa (Black Torch)							
Cordia bahamensis (Rough varronia)	3	6	3	5	14	–	–
Caesalpinia vesicaria (Brasilletto)	1	2	10	–	13	P	–
Byrsonima lucida (Guanaberry)							
Bourreria ovata (Bahama Strongback)							
Tabebuia bahamensis (Five finger)	–	7	5	3	15	E	least Concern
Zamia integrifolia (longer Coontie, Bay Rush)							
Zamia pumila (coontie)							
Palicourea pubescens (Hairy Wild Coffee)							
Ipomoea indica (morning glory)							
Pithecellobium keyense (Rams Horn)							
Chiococca alba (Snow Berry)							
Melaleuca quinquenervia (Paper bark)							
Veronia bahamensis (cat tongue)							
Zanthoxylum fagara (wild lime)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Phialanthus myrtilloides (Candlewood)							
Agave bahamana (Bahama Century)							
Phyllanthus amarus (Gale-O-Wind)							
Scaevola taccada (Hawaiian seagrape)							
Tetrazygia bicolor (wild guava)	6	9	12	10	37	—	least Concern
Myrcianthes fragrans (Bahamia stopper)							
Blepharocalyx salicifolius (stalked stopper)							
Petitia domingensis (Bastard Stopper)							
Phsycotria nervosa (Wild coffee)							
Mosiera longipe (Sweet Margaret)							
Lantana x bahamensis (Wild Sage)	—	—	5	—	5	E	—
Turnera ulmifolia (Buttercups)							

Vine & Grasses Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Anemia adiantifolia (Maidenhair)	30%	5%	25%	10%	18%	—	
Ernodea littoralis (Golden Creeper)	1%	1%	5%	5%	3%	—	
Rhynchospora floridensis (White-top Sage)							
Bidens alba (Shepherds Needle)							
Andropogon glomeratus (Bed Grass)	30%	50%	90%	65%	59%	—	
Toxicodendron radicans (Poison Ivy)							
Cassytha filiformis (Love Vine)	7%	2%	10%	5%	6%	—	
Eragrostis ciliaris (Fringed Love Grass)							
Eragrostis bahamensis (Bahama Love Grass)							
Mucuna pruriens (Monkey tamarind)							
Smilax havanensis (Chaney Briar)	1%	1%	2%	3%	2%	—	

OTHER SPECIES

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pecluma Plumula (comb fern)			3%		3%	—	—
Malpighia polytricha (toothache tree)			3		3	—	—

ENVIRONMENTAL BASELINE DATA COLLECTION SHEET

COLLECTION DATA

Plot ID:	NPC 20		
Pre-field Coordinates:	X: 256742	Y: 2468352	
GPS Coordinates:	X: 256731	Y: 2468359	
Coordinate Method :	Google Maps/Earth (GPS) Maps Website		
Date: Feb 10th 2021	Time start: 10:95	Time finished: 11:56	Oraganization: Forestry / Housing
Team Leader: Terrence Rodgers	Other: —		
Team Members: Cliff Bethel & Andrew Curry			

LOCATION DATA

Country: The Bahamas	Settlement: Carmichael	Island: New Providence

Plot Description: Plot has two (2) Sapling Pine tree. The Plot should be Consider Shurbland because the vegetation in the area are estimated to be two (2) meters in height and love vine (Cassytha filiformis) Poison wood (metopium toxiferum), and Silver thatch (coccothrinax argentea) are the dominate species. The Plot was Previous Cleared before. The first Quadrant was inaccessible because of the thinkess of love vine and Chaney briar. Pain-in-back (Trema lamarckiana) is the largest Shurb in the area estimated to be 2-3 meter in height.

General Observation:
To the east of the plot there is a paved Road and to the west is a large forest Road estimated to be 15-20 meters in length.

HABITAT DATA

Total Size of Area:	60 Acres	Plot Radius	15meters (49 feet)
Forest Type:	Pine forest	Sub-Type:	Dry - Pine forest
Stand Size Class:	—	Land Cover Class:	Treeland (Shurbland) Grassland
Geology:			
Topography:			
Soil Type:	Clay (Loam) Silt Sand	Other:	
Surface or Ground Water:	(YES)/ NO	Other:	
Land Use:	Housing Development		

FLORA

Tree Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Acacia choriophylla (Cinnecord)	–	–	2	–	2	–	–
Pinus caribaea var. bahamensis (Caribbean Pine)	–	2	–	–	2	P	Vulnerable
Manilkara zapota (Sapodilla)							
Bursera simaruba (gum elemi)							
Casuarina equisetifolia (Australian pine)	–	1	–	–	1	I	least Concern
Casuarina glauca (Australian pine)							
Canella winterana (Wild cinnamon)							
Coccoloba diversifolia (Pigeon plum)							
Coccothrinax argentea (Silver thatch)	–	12	10	14	36	P	–
Guapira discolor (Small Leaved Blolly)							
Leucaena leucocephala (Jimbey)							
Lysiloma bahamensis (Wild Tamarind)							
Juniperus barbadensis (Red Cedar)							
Guapira obtusata (Broad Leaf Blolly)							
Piscidia piscipula (Dog wood)							
Metopium toxiferum (Poison wood)	–	32	43	41	116	I	least Concern
Thrinax microcarpa (Thatch Palm)							
Sabal palmetto (Pond top)							
Schinus terebinthifolius (Brazilian pepper)							

Shrub & Herbs Species

Species	Q1	Q2	Q3	Q4	Total	Status	IUCN Classification
Pithecellobium keyense (Ram's Horn)	–	7	10	17	34	–	–
Trema lamarckiana (pain-in-back)	–	3	5	2	10	–	least Concern
Erithalis fruticosa (Black Torch)							
Cordia bahamensis (Rough varronia)	–	4	3	6	13	–	least Concern
Caesalpinia vesicaria (Brasilletto)	–	10	13	6	29	P	–
Byrsonima lucida (Guanaberry)	–	3	2	5	10	–	–
Bourreria ovata (Bahama Strongback)							
Tabebuia bahamensis (Five finger)	–	4	7	10	21	E	least Concern
Zamia integrifolia (longer Coontie, Bay Rush)	–	–	1	–	1	P	Near threatened
Zamia pumila (coontie)							
Palicourea pubescens (Hairy Wild Coffee)							
Ipomoea indica (morning glory)							
Pithecellobium keyense (Rams Horn)							
Chiococca alba (Snow Berry)							
Melaleuca quinquenervia (Paper bark)							
~~*Veronia bahamensis* (cat tongue)~~							
Zanthoxylum fagara (wild lime)							

Shrub & Herbs Species							
Species	Q 1	Q 2	Q 3	Q 4	Total	Status	IUCN Classification
Phialanthus myrtilloides (Candlewood)							
Agave bahamana (Bahama Century)							
Phyllanthus amarus (Gale-O-Wind)							
Scaevola taccada (Hawaiian seagrape)							
Tetrazygia bicolor (wild guava)	–	8	2	5	15	–	least Concern
Myrcianthes fragrans (Bahamia stopper)							
Blepharocalyx salicifolius (stalked stopper)							
Petitia domingensis (Bastard Stopper)							
Phsycotria nervosa (Wild coffee)							
Mosiera longipe (Sweet Margaret)							
Lantana x bahamensis (Wild Sage)	–	6	–	1	7	E	–
Turnera ulmifolia (Buttercups)							

Vine & Grasses Species							
Species	Q 1	Q 2	Q 3	Q 4	Total	Status	IUCN Classification
Anemia adiantifolia (Maidenhair)	–	1%	1%	1%	1%	–	–
Ernodea littoralis (Golden Creeper)	–	15%	25%	10%	13%	–	least Concern
Rhynchospora floridensis (White-top Sage)	–	1%	2%	1%	1%	–	–
Bidens alba (Shepherds Needle)							
Andropogon glomeratus (Bed Grass)	–	95%	97%	90%	71%	–	–
Toxicodendron radicans (Poison Ivy)							
Cassytha filiformis (Love Vine)	–	50%	25%	40%	29%	–	–
Eragrostis ciliaris (Fringed Love Grass)							
Eragrostis bahamensis (Bahama Love Grass)							
Mucuna pruriens (Monkey tamarind)							
Smilax havanensis (Chaney Briar)	–	5%	5%	10%	5%	–	–

OTHER SPECIES							
Species	Q 1	Q 2	Q 3	Q 4	Total	Status	IUCN Classification
Pecluma Plumula (Comb fern)	–	1%	2%	1%	1%	–	–